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Cleaning up Contracting

THE state of the electrical contracting industry has been discussed for very many years. Anybody with a pair of pliers and a screwdriver can call himself a wireman or even an electrical contractor and the public will believe him. The consequence is that real wiremen and contractors, who expect proper payment for their work, find many of their jobs going to these incompetents, whose low charges either bring them into the Bankruptcy Court or compel them to resort to bad workmanship and materials.

There is a place in the home for the cheap, easily replaced articles which are now mass-produced at ridiculously low prices, but there is no justification for installing wiring and apparatus of a kind which will not give trouble-free and safe service for many years.

It is generally agreed that the public (which is a child in these matters) must be protected from the jerry wireman and contractor, but it is not so easy to afford this protection.

It cannot be said that the voluntary registration of contractors has cleaned up the industry; hence the demand from responsible bodies for compulsory registration. But suppose contractors *are* registered—compulsorily or voluntarily—will the desired end be attained? Not by a long way. As Mr. Walter Riggs points out in his paper read at the E.C.A. Conference, to ensure perfect workmanship there would have to be a supervisor for nearly every man employed—an impossible situation.

What is the alternative? The answer suggested by Mr. Riggs is the registration of operatives. If it became necessary for a wireman to hold a licence, granted only after a test of his skill and knowledge, before he could carry out installation work, many wiremen now "practising" (in the "earn while you learn" fashion) would disappear.

The attitude of the E.T.U. towards the licensing of electricians is not known. The immediate effect might be to decrease its membership, but ultimately it would emerge stronger than ever. If the union were one of the sponsors of the scheme, it could reasonably expect all licensed electricians to be members. The places of the nondescript wiremen who would be ineligible for licences or membership of the E.T.U. would be taken by licensed qualified men who would swell the union's membership. More than that, it would become a real power in the electrical industry as the sole representative of the labour side of the installation business.

Bound up with this question is that of apprenticeship. A system of licensing would fail unless arrangements were made to ensure a regular supply of the right kind of man. It has been amply proved that such a flow can be obtained only if there is a properly organised apprenticeship system.

At present a pernicious method is in vogue of employing boys for a year or two until they begin to ask for better wages, when they are dispensed with for younger boys. The displaced youths then wander from job to job and with their smattering of electrical lore start up on their own account or help to keep the "jerry" contractor going. We fear that genuine contractors occasionally act against their own interests in this way.

The E.C.A. has had an apprenticeship scheme operating for some years. Mr. Riggs now suggests as an ancillary idea the registration of entrants into the trade to enable a record to be kept in the cases of boys who go from one employer to another. This seems the next best thing to indentures, but, of course, true apprenticeship is the ideal to be always kept in view.

We hope that the practical suggestions put forward by Mr. Riggs will be given the attention which they merit, for it is time that active steps were taken to clean up the contracting industry.

Things to Come

THE Electrical Contractors' Association has an unusual practice. At its annual conference the President is expected not only to deliver the customary address but also to present an annual report which is, in effect, another presidential address. As Mr. H. M. Drake, this year's president, says, this puts the holder of the office in a quandary, for it is difficult for him to know what to deal with in each oration. Mr. Drake has got over the difficulty by confining his remarks on purely Association matters to the annual report, leaving himself free to devote his address to the future of electricity in the service of mankind. He foresees great developments in lighting and transport, and flirts with the idea of wireless power transmission. This conjures up visions of mains men being called out at the dead of night to deal with trouble caused by atmospherics, or to track down interference caused by someone's oscillating wireless set. We do not think, however, that the cable makers are worrying much about this possibility at the moment. In any case, the installation business would feel it first, for the earliest development would be transmission from the consumer's dis. board to his plugs and lampholders.

Contractors and Retail Sales

SOME excellent general principles are enunciated by Mr. G. N. Walker in his E.C.A. Conference paper on the organisation of contracting and retailing, although their application to some of the smaller businesses may be difficult. Mr. Walker laid particular stress upon the value of the retailing side; indeed, in view of the fierce competition in the installation business, contractors must pay due attention to retail sales if they are to make enough to live on. They have allowed far too large a share to get into the hands of stores of various kinds (we note that the author said nothing about ironmongers) and they should dam this outward flow before they find themselves high and dry with only their installation business left.

The Substitute Tax

LAST week the Chancellor of the Exchequer announced the nature of the new tax which is to replace the withdrawn "National Defence Contribution." It takes the form of a levy of 5 per cent. on the profits of companies and 4 per cent. on those of individuals and firms, the basis employed for assessment being generally the same as that for income tax. Businesses with annual profits amounting to £2,000 or less will be exempt and there will be an abatement where the profits fall between that figure and £12,000. Exemption is also granted to public utility undertakings whose prices or dividends are subject to statutory restrictions. The tax, which is expected to bring in £25,000,000 in a full year, does not affect professions, offices or employments generally. The tax will be deducted in computing the profits of the business for income-tax purposes. Although actually the yield will be higher than that expected from the original scheme, the new tax is considered to be more equitable, and is generally approved.

Rate Relief

IN a recent address Mr. W. E. Foden, former financial controller of the Manchester Electricity Department, mentioned that any reorganisation of electricity supply on the lines of the McGowan Report would make it difficult or impossible for municipal authorities to raid electricity surpluses for the relief of local rates. This goes without saying, for an authority acquiring a municipal undertaking which had been in the habit of handing over some of its profits to the general fund could hardly be expected to continue this doubtful practice, although, of course, it might conceivably be made to do so. There are, no doubt, several arguments against the merging of small undertakings in larger bodies, but this is certainly not one of them. And yet one town council protests against reorganisation largely on this ground, maintaining that the loss of the Electricity Department's "voluntary" contribution would mean a considerable addition to the rates. If the consumers benefit what does that matter? Those who are not consumers will then pay their fair share.

Welding Safety

AN "electro-thermal" process such as arc welding is exempted from the Home Office Regulations, provided the apparatus is so constructed and used as to prevent danger. The onus on the first count rests with the owner, but the responsibility for using the safeguards properly is the workman's. In the more hazardous of the conditions under which welding is often carried out, the use of d.c. at not more than 60 V on open circuit is recommended in a Memorandum prepared by the Factory Department. With a.c. higher voltages than these are required for welding, although 65 V may give satisfactory results with coated electrodes. In most cases 120 V is regarded as safe, but on a.c. systems with an undistorted voltage wave this is equivalent to 85 V (r.m.s.). Moreover, the ill-effects of a shock depend largely upon the time during which contact is made, and even at so low an a.c. voltage as 50, a man grasping a live conductor may not be able to release himself. The use of an auto-transformer to step down the a.c. voltage from the mains supply is, of course, not permissible. For both a.c. and d.c. welding circuits one pole should be earthed at the transformer or the motor generator.

The South African Market

THE growth of mining operations and the consequent incentive to further railway electrification in South Africa in recent times have resulted in a remarkable increase in the amount of electrical equipment imported into the Union. Last year more than a fifth of our total electrical exports went there, and the analysis given elsewhere in this issue reveals that equipment obtained from Britain constituted by far the larger part of the Union's electrical imports. The preponderance of British equipment is especially noticeable in the case of machinery, our share amounting to £1,252,000 out of the total of £1,604,000. Prospects are bright for further improvement in the South African market. Besides industrial activity, domestic electrical development is proceeding apace. It is likely that the Klip undertaking, which at present has an installed capacity of 212,000 kW, will require to be brought up to its full capacity of over 400,000 kW within the next two years, while there is talk of the erection of another large power station on similar lines.

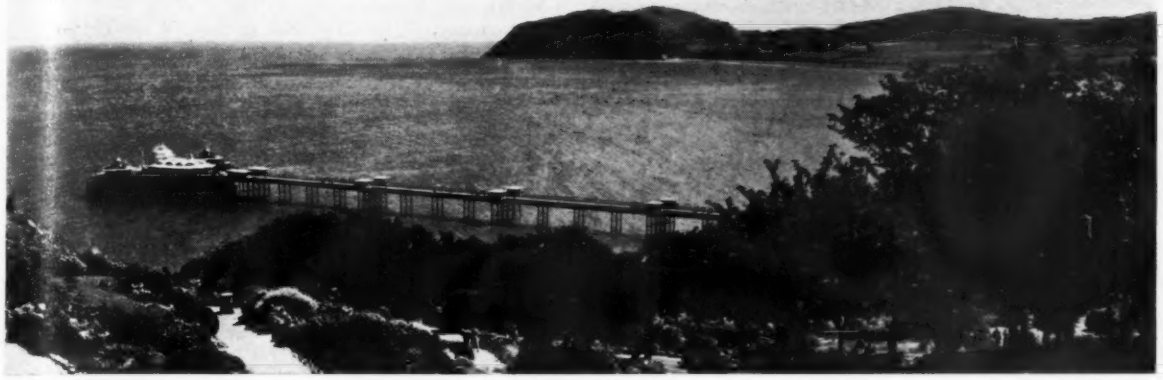
Marine Propulsion

WHILE many advantages can be claimed for the use of the turbo-electric drive on board ship, the real merits of the system can, of course, be accurately assessed only after a reasonably prolonged period of operation under commercial conditions. A report on the operation of the two 18,000-ton liners, *Scharnhörst* and *Potsdam*, for the past twelve months shows that a saving of about 8 per cent. in fuel consumed per voyage has been made compared with a similar geared-turbine liner. The ability to run one turbo-alternator alone when the vessel is steaming at cruising speed is a great factor in this achievement. Avoidance of propeller racing in rough weather is also a great asset.

Obituary

A RECENT advertisement in a Birmingham newspaper offers for disposal a large quantity of gas standards, lamps and control equipment. This follows the improvement in the lighting of Birmingham streets by conversion from gas to electricity. It has been an uphill fight, but electricity is now ousting the strongly entrenched gas forces. In view of this it was strange that a London evening newspaper, in boosting gas company shares recently, should have quoted one street in Birmingham in which the gas lighting has been improved as an indication of the strength of the gas position in street lighting.

Contractors at Llandudno



The eleventh annual conference of the Electrical Contractors' Association and its allied organisations opened at Llandudno on Wednesday evening, when the president (Mr. H. M. Drake) held his reception at the Grand Hotel, the Conference headquarters. Two papers were to be read and discussed yesterday (Thursday) after the delivery of the presidential address in the morning. These and the address are dealt with in this and succeeding pages. The business of the Conference ends to-day (Friday) with the annual general meeting and a short address by the new president, Mr. H. E. Walker. This afternoon delegates will gather at a garden party at the Happy Valley.

A Speculation on the Future

Mr. H. M. Drake's presidential address

HIGH ideals lead to great achievement, says Mr. H. M. Drake in the presidential address which he delivered yesterday (Thursday) morning. In looking ahead far enough to imagine what may possibly be the state of affairs if the progress of the science of electricity continues at the same rapid rate as during the last half-century, he visualises conditions which may facilitate the accumulation of knowledge and produce a healthier, more contented, and more peaceful human being than the mass-produced model of to-day.

The president is considering the atmosphere of unrest throughout the world, not only in international affairs, but in national, commercial, parochial, and even in domestic affairs. Such conditions are inefficient and do not lead to really good productive work. The race in armaments, although it may be essential at the present stage of the development of human nature, cannot be considered as constructive.

Even in the electrical industry the president sees much time and ink wasted in negotiations, committee meetings, and so on, all useful and necessary under present conditions, but he asserts that the time so spent could be materially reduced, and the time saved more usefully employed, if only mutual goodwill and broader thinking were brought into play. Is it too much to hope that the electrical industry in general, and possibly even the E.C.A. in particular, may be the forerunners of the universal peace which is so desirable?

[*Whitlock & Sons*

Mr. H. M. Drake, B.A.

The E.C.A. has always stood for close collaboration of all sections of the industry, andt here is ample evidence of the vast amount of thought which has been given and work which has been done in trying to achieve this end. The members work together in close harmony, and perhaps the Llandudno Conference may encourage the industry as a whole so that manufacturers, wholesalers, supply authorities and contractors will all work together for the common good by providing the best electrical services in the world for the public whom they serve, each section concentrating on its own particular work and not trying to grab something from another section to which it is not really entitled, and thereby causing wasteful overlapping and recrimination.

It appears to be mainly from the point of view of reducing the hours of labour and increasing the hours of leisure upon which Mr. Drake bases his hopes for a better future. Under such conditions it is reasonable to suppose that the health of the world would tend to improve.

It is reasonable to suppose that international agreement will eventually make the shorter working week possible. Any such scheme, however, interacts so profoundly with other industries and with other countries that it cannot be done piece-meal. Individual action—by firms, industries or countries—can only produce chaos and further delay universal adoption of the idea. The League of Nations would do a useful service by concentrating on such matters.

In his ideas as to the practical ways in which electricity can help to bring about a better life the president is even more speculative, but the ideas are certainly none the less valuable. The electrical industry has the power to carry out such development work far more easily than any other industry. The potentialities of electrical energy are so vast and the knowledge of its workings at present are so limited that it does not require a great deal of imagination to realise how fundamentally different life may be.

In the future all systems of internal lighting may be superseded by luminous shutters which would be brought over the windows at night from the outside, thereby dispensing with curtains which harbour dust and germs. Such a system would maintain the same source of light by day and night, making it far easier for architects to design attractive rooms, for the light itself and the shadows cast thereby would be utilised to the best advantage at all times. As it is, the architect has to consider one set of conditions for daylight when the shadows are mostly vertical, and another set of conditions for night when the shadows are mostly horizontal.

It may be argued that such a system would be monotonous, but any doctor will confirm that the strain on the eyes, and therefore on the brain, is infinitely more when work is done by artificial light than when daylight is utilised directly, partly because the intensity of illumination of daylight is so very much greater and partly because eyes are designed for daylight conditions. Truly "white" artificial light is on the way, and when it comes steps should be taken to see that it is distributed, not only indoors, but also out of doors for street lighting, in such a way as to relieve eye-strain and enhance the beauty of buildings which have been handed on to us by past generations. Whether or not it will ever be possible to light our streets and our cities by the simple process of floodlighting the outsides of the buildings, the fact remains that an enormous amount of light is reflected back from an efficiently floodlighted building, and if electricity is generated sufficiently cheaply the æsthetic effect might more than outweigh the inefficiency of such a system.

The president also deals with temperature and humidity control. Such automatic controls are already here, and it is now possible to sit in a room almost hermetically sealed, except for the controlled inlet, and maintained at a temperature previously selected, breathing purified air of the correct humi-

dity regardless of the conditions out of doors. In a few years' time such a state of affairs may be universal in our cities.

Extended railway electrification is also indicated. Such a development as that of the Southern Railway would undoubtedly spread if the price of electricity were lower, and therefore more attractive to long main-line services. The travelling public would benefit, since much of the present unpleasantness of railway travel, particularly noise and dirt, would be avoided.

As to road transport, all horse-drawn traffic should be replaced by electric battery propelled vehicles for all services for which they are suitable. Traffic congestion would thereby be reduced, sanitation would be improved and numberless horses which are unsuitable for the type of road which is expressly designed for rubber-tyred self-propelled vehicles would be available for the work for which they are eminently suitable.

Mr. Drake finds it difficult to see why steps are not now being taken to adopt greater facilities for underground transport to relieve the present congestion in the streets which must get worse as time goes on. It would cost money, but it would employ labour, and such schemes would be of great benefit to the community if used to fill in the valleys of industrial depression. Underground railways cannot be built in a night, and it would surely be wise to set the ball rolling now rather than later.

A supplementary suggestion is a system of moving streets working on the principle of the escalator. Such a system would probably make it necessary to exclude all ordinary wheeled traffic from the urban areas, which would tend towards the reduction of noise and more comfortable conditions for everybody. And why not really automatic traffic control, *i.e.*, signals working direct on the machines rather than on the brains of their drivers, assuming, of course, that the present system of traffic control continues.

Mr. Drake finds it difficult at present to see how further fundamental differences can be introduced to improve factory mass-production systems. But he has his eye on the office, however. We are still a long way from really efficient business methods if we compare office procedure with that normally obtaining in a modern factory. Passing notes from department to department, stamping letters and filing correspondence could all be simplified if offices were built like factories to carry out in a more efficient fashion the work for which they are intended.

We have heard a lot about splitting the atom and the immense amount of power thereby set free, but whether such a discovery would really prove a panacea for all ills is another matter. At the same time, the efficiency so far achieved in the generation of electricity is still low, in spite of the marked improvement since the war, and any rapid development or fundamental change in method, no more than doubling the present efficiency, would stimulate the general use of electricity for all purposes. At present one of the heaviest items is the cost of distribution, but, with the coming of wireless telephony, one is naturally led to question whether some similar invention may not make it possible to dispense not only with the ugliness of the overhead mains but also with their upkeep. This would have a snowball effect and increase the potential uses to which electricity could be put.

The Business Side of Contracting

Paper read by Mr. G. N. Walker, B.Sc., A.M.I.E.E., at the Thursday morning session

IN his paper on "The Business of Electrical Contracting and Retailing, its Service and Organisation," Mr. Walker says that the contractors want to render the greatest possible service to the public and, in return, to live comfortably on their resources. But if the living—comfortable or otherwise—is to continue, then the resources must provide for the training of the selling staff.

The paper presents a plan for the efficient organisation of any contracting business, but the two aspects, service and training, are interdependent.

The organisation scheme is designed to allow the executive head of the business—managing director or proprietor—sufficient freedom from detail work to study his own business and frame the broad general principles on which it should operate.

While the author agrees that in the initial stages of a new business the proprietor may have to be his own salesman, buyer, cashier, foreman, and possibly wireman, he asserts that the parochial lines pursued by the head who personally attends to every customer must render it impossible for the business to expand simply on account of the head's own limitations.

The scheme is portrayed by a "lineage" table which, it is stressed, is merely intended to show one possible general arrangement and to cover the whole staff from the head to the office boy. It is claimed that in general the table will hold good whether the business is large or small, the only difference being that in a small business one man may have to assume the duties of other departments.

Mr. G. N. Walker

There are three main departments with chiefs responsible to the head of the business—sales, progress and accounts—and the author visualises that in a large business the sales department may have to be extended to incorporate agencies, with a special staff, which would work in parallel with the inside and outside salesmen. Apart from the governing principle referred to in relation to the head the table is based on the following principles as concerns the staff:—Every member has definite duties; no member serves two masters; and every member has access to every other member through properly designed channels.

In drawing up his scheme of organisation, Mr. Walker sees the biggest difficulty in providing for that service which gives the customers what they want by the correct technique and at a fair price, or a price which leaves both the customer and the contractor satisfied.

In saying that, as the electrical trade is organised at present, contractors must be prepared to give service free of charge to architects, quantity surveyors and other professional men by way of information, the author has obviously not exhausted his thoughts on the subject. For the moment he merely recommends that the means within the contractor's organisation should be such as to dispose of doubtful inquiries at the minimum cost. He is often amazed by the extent of these inquiries which even a first-class salesman would fail to convert into genuine orders. He suggests that the cost of the service should be debited to advertising.

Another aspect on which Mr. Walker does some "straight talking" is service to the manufacturers from whom contractors hold agencies. If a contractor accepts an agency he should treat it with proper respect and let it share his enthusiasm and take its correct place in his organisation. Far too often a contractor accepts an agency and expects to draw commission on the goods sold in his district without doing a hand's turn to increase the sales. If the agent is not prepared to do more than draw commission, he should, in the name of honesty, decline the agency.

The staff must be chosen with the utmost care; the selection should not be hurried. When a man is selected for particular duties he should be given a free hand within the boundaries set by those duties. And he should be judged by his results rather than by his methods, so long as the methods fall into line with general principles. Duties should be confirmed in writing, and vague instructions such as "make yourself generally useful" should be avoided. An older member of the staff should be detailed to act as host to a recruit for a period.

The author says that homogeneity of applied policy can be obtained only by systematic training. Unless the staff is adequately and continually trained to have a working knowledge of the head's general policy, which may be changed from time to time, serious mistakes will be made. The head should make himself responsible for training his departmental managers, and the managers should be responsible for training their staffs. Well-prepared lectures should be given, with suitable adjustments with regard to the use of employer's and employé's time for them, according to the system of remuneration in vogue.

Although the author says that his ideas for interdepartmental communication may seem to carry the danger of "red tape," along the simple lines given success has been attained by pro-

gressive concerns within and outside the electrical industry for many years. These communications should consist not only of technical and routine matters, but of ideas and general information which members of the staff should be encouraged to transmit for the benefit of the business as a whole. By the interception of the information the head is kept in touch with the "natural course of events." In addition, he should call for reports at definite intervals of time from all department managers. The sales manager should produce summaries of contracts gained and lost, with reasons, and the progress manager should report on such items as the labour market, the completion of contracts and the recording of extras.

In the average electrical retailing business the principles of salesmanship are almost entirely unobserved unless by accident, asserts the author. The least which must be expected from a salesman is good technical knowledge of electrical wiring, a general knowledge of decoration and a good appreciation of domestic details of the home. The saleswomen should be versed in the use and abuse of domestic appliances, and be able to give demonstrations with conviction. In many cases only tact will prevent an unscrupulous customer from turning a profit into a loss, and many invidious processes can be settled with satisfaction only by a first-class salesman. Therefore it pays to pay the staff well.

Whilst training from within is stressed as of primary importance, such media as the E.L.M.A. Lighting Service Bureau, the Electrical Association for Women, the I.E.E. Regulations, and the Fair Trading Policy are pointed to.

Mr. Walker believes that the retail side can be very active and remunerative and that, if properly organised it might rank with the installation side in turnover and profit making. Until such time as contractors make a bold step to regain this field (retailing)—which should be possible with courage and foresight, the loss is no advertisement to the trade and may even give encouragement to competitors to make further inroads on the contractors' preserves. The retail organisation depends much on considerations other than salesmanship for success, and the careful balance of buying and selling is necessary if business is to prosper. For instance, the tabulation of weekly sales and purchases provides comparisons upon which sales policy may be developed.

The author says that the question of showroom or no showrooms has long been a debatable one, until so far as the electrical contracting side of the industry is concerned it has been almost argued out of existence. The very practical character of this paper, however, brings the question very much to the fore. Some excellent advice is offered to those who contemplate introducing or improving showrooms. Supervision is essential right from the start. The premises should be situated in a main street and have a good modern shop frontage. By far the best advertisement for the firm is the display windows. While the author considers that the well-filled window produces more direct sales, he leaves it open to contractors to find the balance between the display window with something of everything for direct sales and the scantily-filled window which is designed to enhance the prestige of the business.

A view of the Grand Hotel, the Conference headquarters

In conclusion the importance of recording and analysing sales is emphasised, and Mr. Walker quotes an example from his own business to show how guidance is obtained in formulating a sales policy and buying for stock.

Capital and Labour in Contracting

Paper read by Mr. W. Riggs at the Thursday afternoon session

IN his paper on "Electrical Contracting and its Relations with Organised Labour," Mr. Riggs calls for the legalisation of voluntary wages agreements, for the complete revision of the system of "zoning" for wage rates, for the compulsory registration of operatives and for some system of registration of apprentices or beginners.

It is asserted that the only way to secure compliance with the National Joint Industrial Council conditions is to secure the legalisation of voluntary agreements, but the author sees disturbing facts in relation to the present position. They are the ordinary difficulty of price-cutting which, in this case, is at the expense of the workers, and the comparatively low degree of skill which results from the payment of low wages. He also sees the greatest hindrance to the smooth and efficient working of the National Joint Industrial Council in the following classes of operatives and employers: those operatives who, from a desire to obtain work rather than draw unemployment benefit, accept wages lower than the standard; those operatives who are out to get all the benefits of higher wages and improved working conditions, but will bear none of the liabilities of membership; those employers who by wage cutting are able to secure work at prices with which National Federated Electrical Association members cannot compete; and those employers who pay the rate of wages and observe the working conditions of the N.F.E.A. but contribute nothing to the working costs and are not bound by its decisions in case of emergency.

Mr. Walter Riggs

It is considered that fair wage clauses in contracts are too indefinite and carry the obligations no further, and it is still possible for non-members of the N.F.E.A. to obtain contracts with such obscure clauses and at the same time to carry on other work not subject to such safeguards. Further, Mr. Riggs submits that there is a considerable element of danger to the public by the continued non-observance of fair-wage conditions. A comparatively low degree of skill must immediately reflect upon the quality of the work which is carried out, and to that extent the electrical industry harbours men who are unqualified for installation work.

Regarding the fear of further "Government interference," Mr. Riggs is an ardent supporter of the system by which wages and working conditions are voluntarily negotiated, but to him it is a tragedy that the work and efforts of the majority of employers and employés in an industry can be frustrated by a minority who seem to have no responsibility beyond their own immediate personal gain. He calls for the ending of a system by which responsible members of the trade pledge themselves to fair dealing and so lay themselves open to unfair attack by the non-participants.

In calling for a complete revision of the existing system of wage-rate fixing in zones, Mr. Riggs makes a sound point in suggesting particular care to ensure that wage rates are so adjusted as to enable employers and operatives alike to retain their hold on the business. The original zoning scheme, instituted in 1919, has been the backbone of all the wages agreements. There have been a number of variations as regards various towns and cities, and, in some cases, larger areas. Anomalies inherent in the scheme have come to light, some of which have been adjusted while others remain.

Contractors must look ahead as far as possible and consider the effect the operation of the grid has had and will have on the electrical development of the country and on the electrical contracting work necessary thereto. The contractors' field has been enlarged by the greater availability of electricity in every town, in most villages and in many rural areas, but the execution of contracts is no longer confined to those firms and persons hitherto operating from a few centres.

The author can visualise, in time, a uniform rate of pay for contracting operatives in all parts of the country, and he thinks the nearer uniformity is approached the better it will be for all concerned. The mere fact of operatives in one district receiving a lower rate of wages than others in a nearby area can only breed discontent, and in all the discussions for either up-grading or down-grading this difficulty has always been a main plank in argument. On this question the national point of view must predominate, and the principle of the greatest good for the greatest number must be borne in mind, while minorities must be protected from hardship.

An overwhelming argument in favour of the compulsory registration of the men who actually do the work is that in order to keep a detailed check on the individual work of the wiremen it would be necessary to employ almost as many supervisors as operatives. No contractor can make a detailed survey of the work carried out by his operatives, and in every case the personal work of the operative should provide the foundation of sound installation practice.

The author thinks that organised labour is not opposed to compulsory registration and that such registration would not weaken the position of the trade union. Indeed, compulsory registration would assist the union to clean up the trade and would strengthen its position since a better and more responsible type of man would readily appreciate the advice and protection which a properly organised and administered union provides.

The reason behind the decision of the Incorporated Municipal Electrical Association to withhold its approval of the compulsory registration of the operative completely eludes Mr. Riggs. A recent pronouncement on the part of the I.M.E.A. seems to confirm the traditional view that supply authorities are inclined to oppose the compulsory registration of operatives, but in reply to a direct question from the Association of Supervising Electrical Engineers the I.M.E.A. gave its support to compulsory wiring rules, registration of contractors, and control of wiring materials, equipment and apparatus.

It is strongly contended that the idea of compulsory registration of operatives is not put forward for the sole benefit of the installation trade as such. The provision of safe, trouble-free installations is a public duty. The main idea is that a man shall provide evidence of his competence to carry out electrical installation work, that he shall be given a licence to carry on that trade, and that he shall lose that licence on being convicted of scamped work and/or dangerous malpractice. The possibility of losing his licence would be in the background of the man's mind and would prevent him from doing wrong even at the order of an unscrupulous employer. Older men would not be expected to pass anything like a written examination. Evidence of suitable experience would be sufficient qualification for a licence, but this would be just as readily revoked in the event of incompetence or malpractice as it would in the case of a licence granted to a lad immediately after his apprenticeship.

Another aspect of this question is the suggestion that boys coming into the trade should be registered. Mr. Riggs says that the employment of boys at the age of 14 or so at a very low wage, with no prospect of becoming indentured, no chance of continuous employment, no genuine opportunity of learning the trade, and nothing to look forward to except intermittent unskilled labour is an injustice to the boy, a disservice to the industry and a danger to the community. Having a smattering of electrical wiring knowledge, but unemployable as a workman, the boy develops into a "jerry wireman," and if he does not carry on wiring work himself, to the loss of the contractor, he is often employed by unscrupulous contractors at a low wage, thereby doing endless harm.

An occasional reminder that the output of the electrical industry depends entirely upon the use of appliances and apparatus in consumers' premises is all to the good, and this the author gives effectively in his historical sketch of developments which led up to the establishment of the National Joint Industrial Council. In a section of the paper devoted specially to the objects and work of the N.J.I.C. causes 1, 3, 8, 9 and 13 of the "Objects" are cited and commented on as having more immediate reference to present-day conditions.

Mr. Riggs concludes by showing that the registration of electricians has been adopted in many foreign countries and British Dominions, and says that it is difficult to see why this country should lag behind in this essential reform.

The Cinematograph Exhibitors' Show

MANUFACTURERS appear to be taking more interest than usual in the exhibition arranged in conjunction with the Cinematograph Exhibitors' Association's annual conference which is being held this week at Harrogate. The Royal Spa Rooms have proved too small to house all the exhibits and a temporary structure has had to be erected in the grounds to provide sufficient accommodation for the thirty-eight stands, the majority of which are of electrical interest.

A feature of this year's displays is that wherever possible apparatus is shown under working conditions. As usual, the largest numbers of exhibits relates to film projection, much new equipment making its appearance. Reduction of running costs is the aim of the Ross type "D" arc lamp shown by Pathé Equipment, Ltd., and also the new high intensity lamp introduced by Kamm & Co., Ltd. The "Ernemann VII B" projector and Crypton rectifier equipment are features of the Walturdaw Cinema Supply Co.'s exhibit, while among the apparatus seen on the stand of J. Brockliss, Ltd., is the "Super Simplex" projector on the latest type of heavy-duty pedestal, arc lamps and the well-known Stelmar spotlights. Kalee, Ltd., show a new type of projector and the "Suprexa" carbon produced by Ship Carbons, Ltd., is the latest development in small-diameter high current density carbons.

"Davenset" static rectifiers and control equipment for arc lamps are displayed by Partridge, Wilson & Co., Ltd. This company as well as the Edison Swan Electric Co., Ltd., and Batteries, Ltd., also makes a speciality of emergency lighting apparatus. A Westinghouse twin 45-60 cinema arc metal rectifier equipment is to be seen in operation, a wattmeter in the mains circuit enabling claims relating to efficiency and low running costs to be examined.

On the sound side visitors have the opportunity of inspecting the latest apparatus of G.-B. Equipments, Ltd., including the new B.A. "Duosonic" system. Even distribution of sound throughout the auditorium is the object of a novel loud-speaker assembly embodied in the "Trufonic" reproducing apparatus of British Talking Pictures, Ltd. Charts showing the network of service facilities constitute the main background display of the stand of the Western Electric Co., Ltd. Distribution of B.T.H. products, which cover all cinema projection and sound requirements, is undertaken by Sound and Cinema Equipment, Ltd.

Cinemas offer an unrivalled opportunity for the use of spectacular lighting, both internally and externally. On the G.E.C. stand is a model cinema frontage with a complete Claude-General installation employing the latest types of neon tubing. Adjoining this exhibit is an example of "Osira" colour flood-lighting, together with examples of "Osram" lamps, including coloured architectural types, and carbons. F. H. Pride are specialists in cinema lighting and electrical equipment of all kinds.

In conjunction with Hall & Dixon, Ltd., the Strand Electric and Engineering Co., Ltd., is showing a complete stage equipment and a working model stage where demonstrations of colour lighting may be seen. Holophane, Ltd., is illustrating how efficiently light is controlled by prisms (the basic feature of the company's illumination system). The synchronisation of colour and music in conjunction with a Würlitzer organ is also attracting much attention, and an illuminated organ console is shown next to the 1937 Compton "Electrone" electric organ. Novelties in the way of electric signs are represented by Ciro-sign, Ltd., and K.F.M. Signs.

All electrical stage accessories such as curtain controls, organ and orchestra lights, stage lighting equipment, &c., are supplied by W. J. Furse & Co., Ltd. Though making its first appearance at the exhibition, the Etna Lighting & Heating Co., Ltd., is well known for its installation work in the cinema and theatre world and has carried out nearly fifty contracts for one circuit alone.

Heating of cinemas is simplified by the use of the "Robot" automatic underfeed stoker manufactured by the Riley Stoker Co., Ltd. Electric ticket issuers are shown working by Automaticket, Ltd., and Accurate Check, Ltd.

The exhibition closes this evening.

Water-heater Improvements

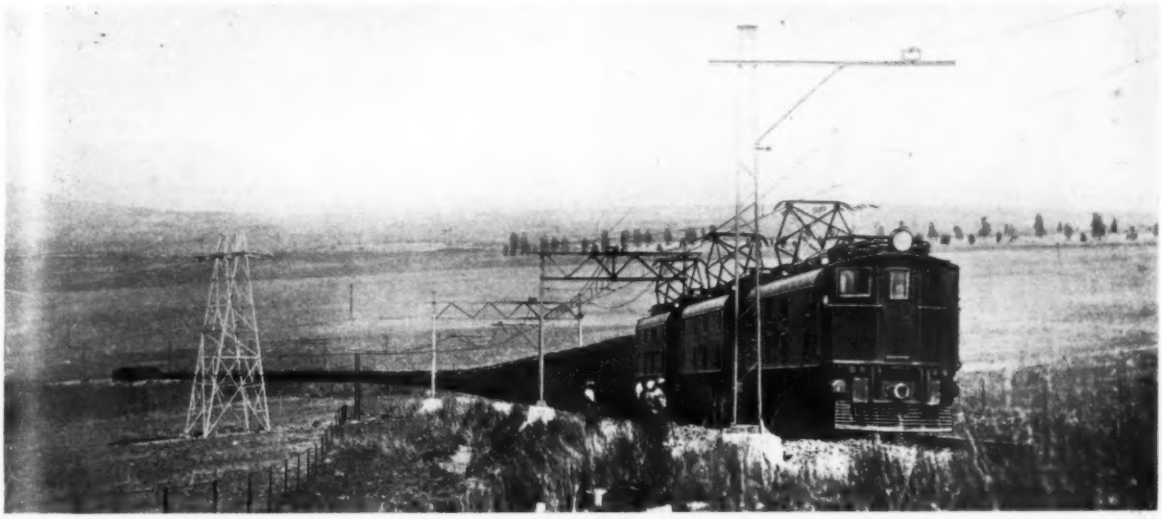
Among a number of recent improvements to the "Charlton" vertical cistern-type storage water heater are the incorporation of a water trap round the top of the cistern and also the use of a cold feed system, the water being introduced to the heating cylinder *via* a pipe taken through the lagging. The apparatus is available in sizes from 5 to 30 gal.

To the range of "Model C" non-pressure type water heaters has now been added a 3-gal. size with a 1-kW loading. The makers of "Charlton" equipment are Johnson & Phillips, Ltd., of Charlton.

The Natal Railway Electrification

Twenty-five new 1,200-h.p. locomotives

DURING 1935 the Metropolitan-Vickers Electrical Co., Ltd., received from the South African Government orders for twenty-five 1,200 h.p. electric locomotives, which have been made necessary by increased traffic, and by extensions of the electrified Natal Railways which will shortly increase the route-mileage from 170 to 383 and the track-mileage from 287 to 634. Orders for seventy-eight locomotives were placed by the South African Railways with the Metrovick Co. during 1922, this order being increased in September, 1925, to make a total of ninety-five locomotives.



Three 1,200-h.p. locomotives hauling a heavy mineral train on the South African (Natal) Railways

The first two were put into preliminary service for training drivers about the middle of 1924. The electrical equipment of the 171 miles of line from Pietermaritzburg to Glencoe was finally completed in April, 1926, when a complete electric freight and passenger service was instituted between these towns. Consequently the original locomotives have now been in constant service for periods varying between about nine and twelve-an-a-half years.

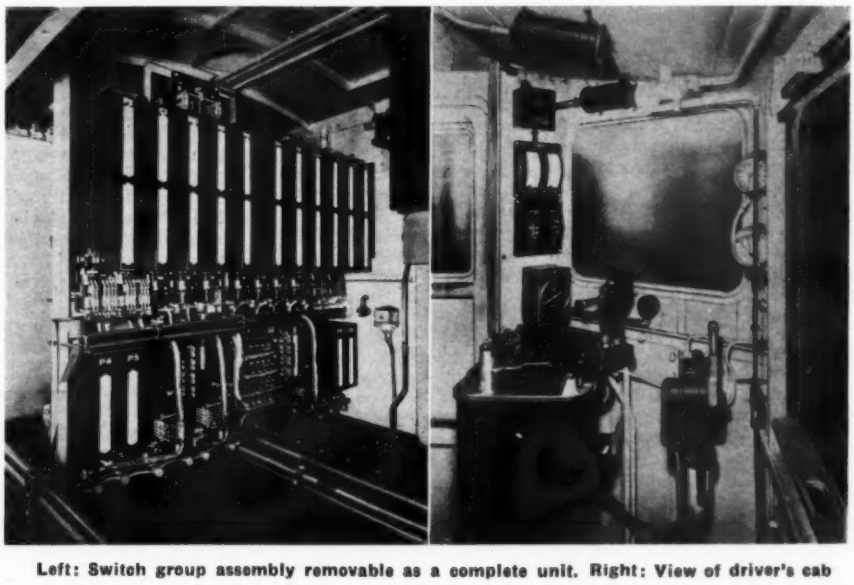
The 150 miles of route between Volksrust and Johannesburg may be electrified in the not too distant future, and the journey time from Johannesburg to Durban will then be reduced considerably. From Glencoe to Pietermaritzburg the route is over very hilly country. There are many steep and long gradients and also many sharp curves; the sharpest is of 300 ft. radius, there are many of 573 ft., and about 25 per cent. of the track mileage has a radius of 1,100 ft. or less.

Glencoe is situated near the centre of the Natal coal field, and the transport of coal to Durban constitutes a large part of the traffic on the line. Powerful steam locomotives used to haul the heaviest trains between Glencoe and Pietermaritzburg in 16 hours 30 minutes, with the following loads: Glencoe to Ladysmith, 1,000 tons; Ladysmith to Mooi River, 820 tons; Mooi River to Pietermaritzburg, 850 tons. An electric train with three locomotive units under the control of one driver and his mate now conveys a load of 1,500 tons the whole distance in 10 hours 15 minutes.

The gauge of the railway is 3 ft. 6 in. Power is supplied from a generating station at Colenso through an 88,000-V 3-phase transmission system to sub-stations equipped with transformers and either one, two, or three motor-generator sets. Each motor-generator set consists of a 500 r.p.m. synchronous motor, two 1,000-kW generators connected in series to deliver 3,000 V d.c., and two exciters. The sub-stations are normally unattended, and are started and stopped by semi-automatic control from an adjacent signal box or station. From the 3,000-V d.c. overhead line power is collected by pantographs, two of which are mounted on the top of each locomotive. The difficult nature of the track makes high speeds impracticable for heavy freight trains. Nevertheless, the locomotives run on an average 7,000 miles per month each, and their maintenance cost is small, *viz.*, 1.84d. per mile for the year 1934-35. Besides valuable savings in tyre and brake shoe wear, and greater safe speeds made possible on down grades, the use of regenerative braking returns to the line at least 25 per cent. of the energy absorbed by the locomotives.

Mr. F. Lydall has stated that the electric locomotives in 1927 worked a total of 6,383,010 miles, representing 5,600 miles per month per locomotive, and that the electric service was then worked by 85 sets of drivers and assistant drivers, who replaced about 300 drivers and 300 firemen required under steam operation. That alteration was coupled with a large reduction in overtime. The saving to the administration in respect of wages of the locomotive crews and the guards was estimated as amounting to between £120,000 and £180,000 per annum.

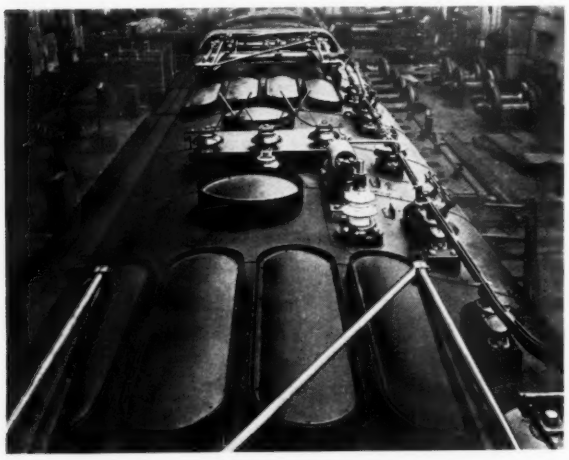
Each of the new locomotives is of 1,200-h.p. capacity, with four axles each driven by a 300-h.p. axle-hung "Metrovick" traction motor. The locomotives are arranged for operation either singly or two or three coupled in tandem and controlled from the leading locomotive by a single driver and his assistant. They are suitable for multiple unit working in combination with any of the original ninety-five locomotives. The new locomotives weigh 65.6 tons, and have a tractive effort on full



Left: Switch group assembly removable as a complete unit. Right: View of driver's cab

field at hourly rating of 21,200 lb. at a speed of 21¼ m.p.h., and on full field continuous rating of 16,400 lb. at a speed of 23 m.p.h.

While the new locomotives are, in the main, duplicates of those supplied previously, the experience of eleven years and the advance in design made during that period have suggested a number of modifications and improvements. These alterations have been made without in general preventing inter-



The roof gear of one of the new locos.

changeability of the various components of the old and new locomotives.

Five bodies were ordered from the Swiss Locomotive Co. and twenty from Hawthorn Leslie & Co. All the bogies, gearing, traction motors, auxiliary motors and generators, pantographs, electrical switchgear and control gear are being made, and the locomotives are being assembled complete, in the Metropolitan-Vickers works.

The draw-gear is of the "Alliance" automatic type, as the existing rolling stock has been converted in this respect, and "Timken" roller bearing axle boxes are employed. The drive to the axle in the original locomotives was from a pinion on the motor armature shaft to a solid gear wheel on the axle. In the new locomotives a spring gear wheel is being fitted which cushions the drive.

The auxiliary machines in each locomotive consist, as before, of an air compressor for the operation of the locomotive brakes and the electro-pneumatic control gear. It is of the Westinghouse Brake Co.'s two-cylinder reciprocating CM 38 type, gear driven by a 110-V d.c. motor, and identical with those supplied previously, as the latter have functioned successfully. The exhauster, which produces the vacuum for the train brakes, is also driven by a 110-V d.c. motor and is of the Reavell rotary drum pattern, similar to those supplied previously, but to reduce the working temperature a ventilating fan and cover have been added to each machine.

The 16-kW and 28-kW motor-generator sets each consist of a 3,000-V a.c. motor, a d.c. generator, and a directly coupled blower for the forced ventilation of the main motors. The 16 kW m.-g. set works in conjunction with a small secondary battery and supplies energy for lighting, for the control circuits, and for the d.c. motors driving the compressor and the exhauster. The 20 kW m.-g. set supplies low voltage d.c. to excite the fields of the main motors during regeneration. Instead of two commutators in series across the 3,000 V supply, the new machines have single commutators which have considerably reduced both bulk and weight of the motor-generators. Changes in the arrangement and lay-out of the electro-pneumatic control gear have provided better cooling and ventilation, improved access to apparatus requiring maintenance attention, and a reduction in the time a locomotive is kept out of commission during its regular five yearly general overhaul.

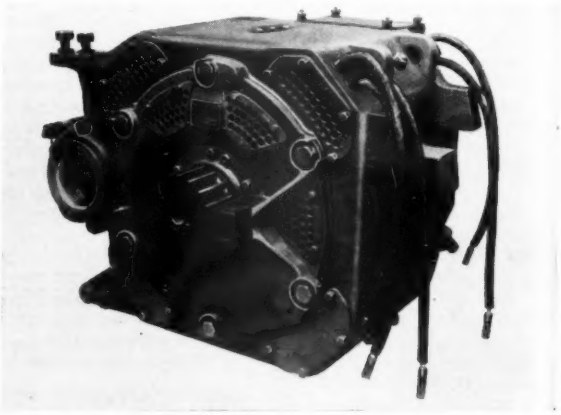
Both old and new locomotives contain a driver's cab at both ends, a corridor from end to end connecting the two cabs, and a central compartment containing all the 3,000 V control apparatus with an interlocked door which cannot be opened except when the pantograph is down and earthed. The central high-voltage compartment is divided into three separate sections instead of, as formerly, being a single compartment containing both high-voltage control gear and resistances. The centre section contains the unit switches and other control gear, while the two outer sections house the main starting and other resistances.

In place of a clerestory roof to carry away the heat produced by the resistances, in the new design the resistance chambers admit cool air through large mesh covered holes in the floor, while heated air passes freely away through four large ventilating cowls on the roof.

A notable alteration is that the unit switches and all other 3,000-V electrical control apparatus in the equipment are mounted in two switch-groups facing each other across the body of the locomotive. Ample space in front of and behind each equipment gives complete accessibility. Any unit switch can be removed and replaced by a new switch in a very short time, and during the five-yearly general overhaul either switch-group can be taken out through the top of the locomotive, and replaced immediately by a reconditioned switch-group, thereby saving several days in the time during which the locomotive is out of commission. At the top of each switch-group is a double-element overload relay, and immediately below there are eleven 3,000-V main unit switches. The bottom row contains, from left to right, two stabilising resistance switches, a motoring regeneration change-over drum switch, a series-parallel motor combination drum switch, a front connected terminal board, a reverser drum switch, and two exciter field unit switches. All the control wires to the magnet valves and interlocks are permanently connected to the front terminal board, so that it is only necessary to remove the external power and control connections from the back of the switch group before lifting out the complete assembly.

The three drum type switches are much more compact than the corresponding cam switchgroups which they replace and, moreover, they have a lower contact voltage drop, so that they are confidently expected to need less maintenance. Similar gains in compactness and maintenance costs have been effected by substituting four smaller type electro-pneumatic unit switches for the cam switchgroup used in the earlier locomotives to give the reduced field running notches. Further simplification and compactness results from a new type of fuse and contactor for the motor-generator sets, both of the new motors being switched direct on the full 3,000-V supply circuit without the use of starting resistances.

In the original locomotives the higher resistance steps of the



One of the 300-h.p. motors with roller bearings

starting and the regenerative stabilising resistances were of metal strip, the remainder being of cast iron. In the new locomotives these resistances consist entirely of cast-iron grids, which permit a more compact arrangement, and have increased capacity, to allow abnormal shunting and train marshalling with notably less risk of overheating.

The new pantographs have only one collecting pan and exert a reduced line contact pressure of 16 lb., which will reduce wear of the overhead line. They each weigh about 400 lb. less than the older ones, are more rigid transversely, and more easily follow a varying height of overhead line without sparking. Change in design enables the pantograph to be raised and lowered without causing any shock to the overhead line or roof.

The Merging of Small Undertakings

Speaking at a meeting of the Institute of Municipal Treasurers and Accountants last week, Mr. W. E. Foden, formerly financial controller of the Manchester Electricity Department, maintained that the final solution of the electricity distribution question would be the formation of public regional boards or a central authority on the lines of the Post Office. He considered that small municipal authorities should be prepared, in the interests of their consumers, to surrender the control of their undertakings to larger municipalities or companies, the terms of acquisition being the same as for small companies. Referring to rate relief from electricity profits he said that if the recommendations of the McGowan Report were followed this would become very difficult if not impossible.

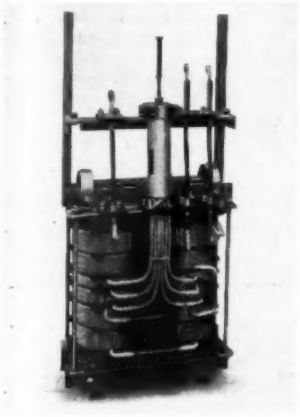
Arc-Suppression Coils.

By A. H. Gray, M.Sc., A.M.I.E.E.

Earthing the neutral of transmission systems

WHEN electrical systems were first run on the three-phase principle it was customary to operate with an insulated neutral, little trouble being experienced due to earth faults. To-day the growth of supplies has been such that earth faults, particularly arcing earths, necessitate special precautions due to the large zero-sequence capacity currents available.

Both in this country and in the United States of America these troubles have been mitigated by earthing the system neutral, either solidly or through some selected resistance. On the Continent, however, the problem has been approached from a different angle and, possibly due to telephone interests, has been solved very effectively by a modified form of insulated neutral.



Arc suppression coils removed from their tank

A study of fig. 1, illustrating an insulated three-phase system both in a healthy state and in the presence of an earth fault, indicates that the following phenomena can arise due to the fault:—(1) The voltages of the sound phases are raised to a value of $\sqrt{3}$ times their normal value. (Generally speaking this increased voltage is of no serious consequence with a well-designed system.) (2) The voltage displacement can give rise to transients generally known as ignition surges, which under some conditions may cause flashovers in various parts of the system.

The advantages and disadvantages of earthing the neutral to obviate these troubles are too well known to need description here, but the method originated on the Continent, namely earthing through an inductance, is well worthy of comment.

Earthing Through an Inductance

The arc-suppression coil, first introduced by Professor Petersen in Germany and pioneered in this country by the Metropolitan-Vickers Electrical Co., when used under the correct operating conditions has provided one of the most successful forms of protection available at present.

The method consists of installing between the neutral of the system and earth a coil or number of coils the inductance of which tunes the zero-sequence capacity current of the system (fig. 2). Thus, if true resonance were obtainable, that is, no current would flow through the fault and any arc which might have occurred would immediately be quenched. In practice, true resonance cannot be obtained, but even so the arc-quenching capabilities of the coil are preserved over a considerable range of dissonance; thus the operation of the coil in practice needs little attention.

The advantages of this method of earthing may be summarised briefly as follows:—(1) Earth faults initially due to transient causes, *e.g.*, direct or indirect lightning strokes, are rendered harmless by the immediate abolition of the arc. As some 80 per cent. of earth faults are due to these causes, a considerable number of service interruptions are thus prevented. (2) It is possible to run a system that is protected by an arc-suppression coil with one phase earthed until service conditions will allow the faulty section to be isolated. In this country large feeders have been run for periods of ten hours or more with one phase earthed. (3) Since the fault current is limited to small values the dangers due to large voltage drops do not arise as is possible with solid earthing. (4) The immediate suppression of the arc prevents the formation of dangerous intermittent arcing earths and consequent possibility of enveloping the sound phases.

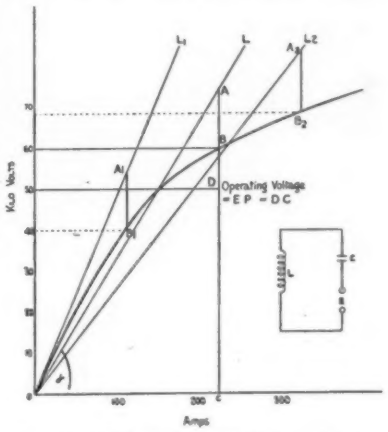


Fig. 3.—Typical magnetisation curve

While the presence of a fault on a system that is protected by an arc suppression coil raises the voltage of the sound phases to the line voltage value (which, generally speaking, is of no consequence) it does not give rise to the dangerously high-value transients generally associated with resonant conditions. This is due to the presence of the iron core in the coil, which is designed to be saturated before any serious voltage rise can occur. Fig. 3 illustrates a typical magnetisation curve of a coil operating at, say, 50 kV, while OL represents the zero-sequence capacity current of the system, in which $\tan\alpha = 1/3\omega C$ (neglecting losses). In this particular case the system and coil are assumed to be in perfect tune. If an asymmetrical voltage EO (in the diagram EO is made equal to 30 per cent. EP, a larger value than need be expected in practice) be represented by AB, it will be seen that the voltage across the coil can only be BC, *i.e.*, 60 kV (20 per cent. increase), whereas if the core were not saturated the voltage could rise to an extremely high value. Even when the coil over- or under-compensates the system to the extent of 30 per cent., as indicated by OL1 and OL2, a 30 per cent. asymmetrical voltage at the neutral, represented by A1, B1 and A2, B2, will only give rise to a 37 per cent. increase of voltage across the coil. It must also be remembered that the effect of iron saturation on the wave shape will also tend to reduce this voltage rise still further, as does the introduction of resistance into the system; hence, it can be stated that the presence of a correctly designed coil on a system has little effect on the voltage displacements at the neutral due to earth faults.

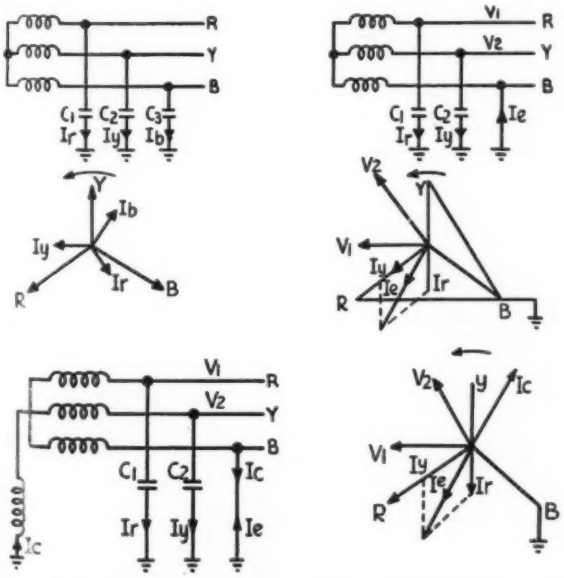


Fig. 1 (top).—Insulated three-phase system in healthy state and in the presence of an earth fault. Fig. 2.—Insertion of coil between the neutral of the system and earth

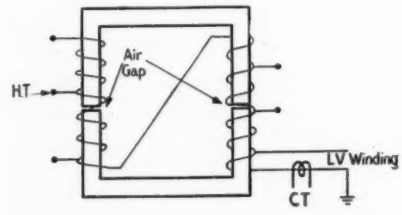
Coil Construction

The coil in appearance is generally similar to a single-phase transformer and is generally built on either a two-limb or a three-limb core. The former is the usual construction and the latter is used where a large range of tappings is required (see fig. 4, which also indicates the air gaps located in the core in order to obtain the requisite reactance). The whole coil, with a current transformer and a tapping at the earth end to provide a low-voltage winding, together with an off-circuit tapping switch which is provided for the control of the main tappings is immersed in a tank containing oil and complete with the usual fittings such as the oil conservator and mechanical breather. It should be added that it is usual to supply these coils with a tapping range of 1 to 2, so that the necessary tuning arrangements can easily be made in the event of a major system change.

While each system must be examined on its own particular merits, it is usual to work on the following lines for protective purposes: (a) For well-insulated overhead-line systems where

$\omega L = 1/\zeta\omega C$ where ω = circular frequency of system, L = inductance of coil, and $C_1 = C_2 = C_3 = C$ = phase-zero sequence capacity,

the switchgear is of the open outdoor type the arc-suppression coil forms the best type of protection; (b) on systems comprising overhead line and cable operating in conjunction with metal-clad switchgear it is usual to install an arc-suppression coil of intermittent rating, operating in conjunction with a switch arranged to short-circuit the coil either directly or through a resistance after some predetermined time (such an arrangement as that illustrated in fig. 5 provides adequate protection for all normal earth faults which are due to transient causes, backed up by ordinary earth protection when the fault is sustained longer than a pre-selected time); (c) in the case of systems using only cable the arc-suppression coil does not provide many advantages over the usual resistance-earthing method.



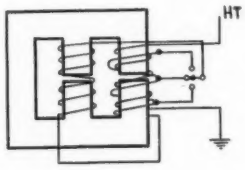


Fig. 4.—Coil built on two- and three-limb cores

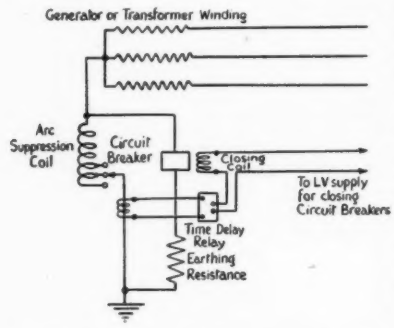


Fig. 5.—Inclusion of automatic circuit-breaker for delayed short-circuit of arc suppression coil

It is usual to provide means whereby audible and visual alarms can be given on the occurrence of an earth fault; fig. 6 illustrates a general form of such an alarm equipment, which consists essentially of a relay, bell and lamp, together with a recording voltmeter and ammeter. On the occurrence of a fault current flows through the coil, producing a voltage across the winding T. This voltage energises the relay and recording voltmeter. Immediately the relay itself operates the alarm bell rings, the lamp lights and both recording instruments operate. (It is usual to supply an additional pair of hand-operated contacts in the relay whereby the alarm bell may be cut out if desired.) This relay is also fitted with a counting mechanism which indicates the number of operations of the coil.

A further indication is sometimes provided by the introduction of a synchronous clock, which is not self-starting, operating in conjunction with a set of normally closed contacts in the relay which are made to open circuit at a prearranged time after the main relay contacts have been closed. Such an addition allows the synchronous clock to be stopped in the event of sustained earth faults, and thus enables the operation staff to ascertain the time of occurrence of the fault.

The popularity of the arc-suppression coil is increasing, not only in this country (where the Central Electricity Board has been among the pioneers) and its Dominions, but in the U.S.A., and whereas the use of the coil was limited to the Continent some few years ago equipments have now been commissioned in most countries during the past few years.

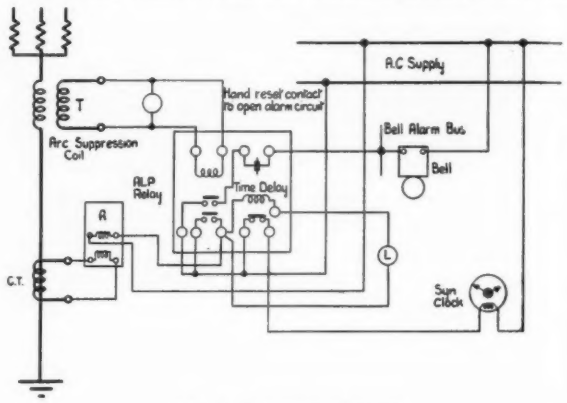


Fig. 6.—Alarm equipment

An Electrified Rack Railway

THE work of electrifying the rack railway which runs from the level of Lake Lucerne at Alpnachstad to the summit of Mount Pilatus has recently been completed. The line, which is well known to Swiss tourists, was completed in 1888, and up to the present has been operated by steam locomotives. The line has a gauge of 31½ in. and is now being operated on the overhead conductor system by d.c. at 1,500 V. The new rolling stock, the mechanical portion of which has been built by the Winterthur Locomotive Works Co., and the electrical equipment by the Oerlikon Co., comprises eight coaches, each weighing, without its forty passengers, 9 tons 8½ cwt. Each coach is provided with a twin motor developing 210 h.p. at the one-hour rating.

Power is transmitted between the motors and the rack on somewhat novel lines. The twin motors are mounted at the forward end of a spring-supported underframe, with their shafts coupled to universally jointed propeller shafts which terminate in bevel pinions meshing with horizontally mounted bevel crown wheels. On the same short vertical shafts as the latter are spur pinions which mesh with spur wheels secured to a further pair of short vertical shafts, on the lower ends of which are special gear wheels engaging with the teeth on each side of the centrally located rack rail. The total reduction is 18 to 1.

Electricity is collected from the overhead conductor by two pantographs, the front one being used, when required, as an ice scraper. A choking coil is connected in front of the gear in the coach, while an automatic circuit-breaker with separate current release serves as protection against overload. The circuit-breaker is also so arranged that it can be operated by the "dead man's" handle device. Each coach has two controllers for direct operation, one for use only when travelling uphill and the other for electric braking during descent, for shunting and occasionally for use during ascent.

As the Pilatus railway is stated to have the steepest gradients of any rack railway in the world, it was decided to adopt electric regenerative braking. In order to ensure smooth starting and fine regulation of the braking during descent the controllers have been provided with eighteen regulating steps. The starting and braking resistances are in a protected box in the underframe, the resistances being cooled by a double turbo-fan driven by a d.c. motor.

For mechanical braking each coach is provided with two band brakes; one of these acts on the pinion shafts of the drive at the end of the coach facing downhill, and the second operates on braking pinions at the uphill end of the undercarriage. A ratchet device is also embodied in the latter to prevent automatically and instantaneously any backward running of the coach when stopping on an uphill journey, or in the event of an interruption in the power supply system.

There is, in addition, a centrifugal brake which also acts on the braking pinions and stops the vehicle automatically when running downhill if the maximum permitted speed should be exceeded. The centrifugal brake is also arranged to come into operation in the event of the driver becoming incapacitated, it being connected with the control apparatus in such a way that the electricity is cut off from a solenoid which releases the centrifugal brake as soon as the driver ceases to depress a pedal arranged near the controller at the downhill end. A similar pedal is provided in the driver's cab at the uphill end; in this case, however, there is no need for the centrifugal brake to come into operation as the ratchet device acts automatically both when the driver is incapacitated and when the electricity supply fails. When the pedal is released the automatic circuit-breaker is tripped through the intermediary of an auxiliary battery to which the electric lighting system, the warning signal and the solenoid mentioned above in connection with the automatic brake are also connected.

Steam locomotives took 70 min. to accomplish the ascent and 75 min. for the descent. With the new electrically driven coaches these times have been reduced to 35 and 41 minutes respectively, the uphill speed averaging between 5.3 and 7.5 m.p.h. and the downhill speed between 3.75 and 5.6 m.p.h.

Power for the line is obtained at 50 kV from the system of the Central Switzerland Power Co. and is converted to 1,500 V d.c. by means of two Brown-Boveri mercury rectifiers.

St. Pancras Town Hall

A well-planned heating installation

AN electric heating installation of more than usual interest has just been completed at the new St. Pancras Town Hall in Euston Road, N.W.4, which is to be officially opened next Thursday. Combining an embedded hot-water wall-panel system and a plenum air-conditioning installation, the plant derives all the hot water required from two 500-kW electrode boilers (one G.E.C. and one Bastian & Allen) feeding an 18,000-gal. thermal-storage cylinder.

Venner time switches operating magnetic valves permit advantage to be taken of all off-peak periods during which the Electricity Department is in a position to give specially low rates. Actually, the boilers can be on circuit for nineteen hours out of twenty-four but this is seldom, if ever, necessary, since, with its 5-in. lagging of asbestos and cork, the storage cylinder retains heat for twenty-two hours.

It speaks well for the reliability of modern equipment that it has not been considered necessary to duplicate either the 2-b.h.p. primary pump (that pumping the water from the boilers to the storage cylinder) or the 1½-b.h.p. one supplying the hot water for the air-conditioning system. These pumps, like the two 3-b.h.p. secondary pumps which circulate hot water from the cylinder to the various parts of the building, are of the Bull "Super Silent" type and operate at 1,400 r.p.m.

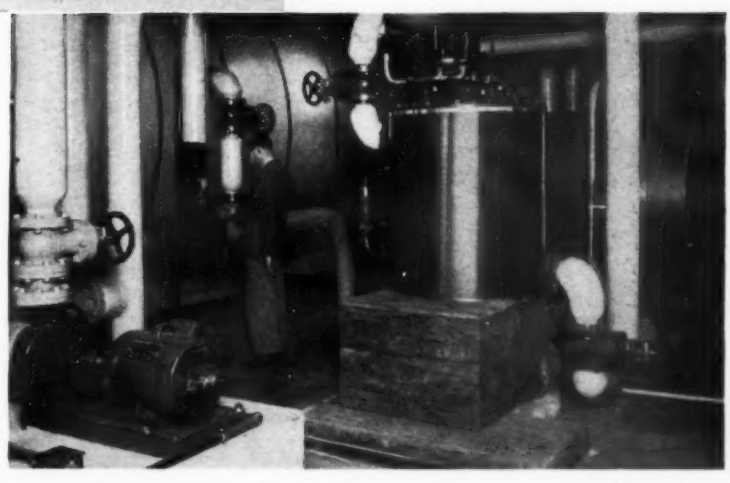
Mixing valves are used to reduce the temperature of the water before circulating it round the building, thermostats regulating it about 90 deg. F. To avoid any possibility of damage to decorations, due to the water in the wall panels being raised, on account of some fault, above the normal temperature, a safety valve has been incorporated in the main outgoing pipe, cutting off the supply to the panels at a temperature of 140 deg. F.

This, however, is only one of the precautions taken to provide a care-free fully automatic installation. The neatly designed control board (G.E.C.) is fitted with a fault indicator, overload protection, an emergency thermostat, and switches for isolating the boilers should there be an unbalanced phase of over 10 per cent. All the pumps are remote-controlled from the board, and it is possible to take the temperatures at twenty-eight points in the building by means of Negretti and Zambra remote thermometers.

The embedded wall panel system is employed for the general heating of the building and, except in a few special situations, the plenum system is intended solely for the Council Chamber, the Assembly Hall and the demonstration kitchen and the electricity showrooms. The air to be circulated is first cleaned in a washing chamber by jets of water sprayed into it by means of Pulsometer pumps.

To prevent excessive cooling of the air hot water pipes connected with the thermal-storage cylinders are run through this washing chamber, the cleaned air being warmed by passing it through further sets of gilled hot water pipes before transmitting it by means of fans to the various duct systems. A 13-b.h.p. motor is required to operate the fan for the Assembly Hall, 2½-b.h.p. machines sufficing for the other two systems. In the case of the Assembly Hall installation the extraction fan is interlocked with the starter of the ventilating fan. Brookhirst switchgear controls this air-conditioning system, which is thermostatically controlled and completely automatic in its operation.

The adoption of the above-described heating system is likely to prove of good service to the Electricity Department, whose well equipped showrooms in the new building will be completed in a few weeks. In addition to having this "full-sized working model" to show to interested persons the Department will also have, in the all-electric kitchen equipped to meet general catering requirements, an excellent opportunity for demonstrating the industrial type of cooking apparatus under actual working conditions. The apparatus installed there, all supplied by Richard Crittall & Co., Ltd., who were also responsible for the building heating and air-conditioning installations, includes two 14-kW ranges, a 12-kW roasting oven, two 9-kW vegetable boilers, a 9-kW hot-plate, two 6-kW steamers, a 6-kW bain marie and a 4½-kW griller.



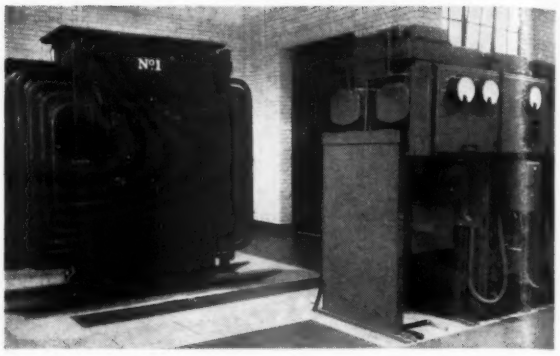
[*Elec. Rev.* photos.

The new St. Pancras Town Hall at night, the electrical control room, and the heating chamber

Altogether, the building will a have total load approaching 2,000 kW, and, incidentally, the electricity showrooms, which we hope to describe soon, will be equipped with no fewer than 300 plug points. A very attractive and efficient lighting system has been planned throughout, and the Assembly Hall, besides furnishing an example of the modern treatment utilising illumina-

tion as a decorative medium, is provided with up-to-date stage lighting equipment (supplied by the Major Equipment Co., Ltd.). Emergency lighting is catered for by Hart accumulators charged from "Davenset" apparatus. Among other electrical equipment installed are Reliance automatic telephones, a Gent fire alarm system and four Waygood-Otis lifts, two passenger and two service.

The 400/230-V 3-phase a.c. supply comes from the St. Pancras Electricity Department's sub-station on the premises, where the 5,200-V supply controlled by Ferguson Pailin oil-circuit-breakers is stepped down by means of two 1,500-kVA G.E.C. transformers with on-load tap-changing devices. The low-voltage side is handled by a Metrovick distribution board. The building was designed by Mr. A. J. Thomas, F.R.I.B.A., The electrical contractors were Higgins and Cattle, Ltd., who carried out the work in conjunction with the St. Pancras Electricity Department, and were also responsible for the design of an attractive floodlighting installation for the exterior. Glovers' cables have been employed throughout, and extensive use has been made of Sanders iron-clad switchgear.



[*Elec. Rev.* photo.

One of the 1,500-kVA G.E.C. transformers and the high-voltage Ferguson Pailin switchgear at the Town Hall sub-station

Repair Work. By Works Engineer

The elements of costing and estimating

A CERTAIN amount of money is usually laid aside every year for maintenance repairs in large factories, and the plant engineer who has charge of this work must see that the sum is not overdrawn or trouble may arise at the end of the financial year. Executives have usually no knowledge of the intricate problems which the plant engineer has to face to ensure that the amount is not exceeded. It is therefore necessary to make fairly accurate estimates at the beginning of the year in order to ensure a correct balance, and the plant engineer must be conversant with methods of estimating and costing.

Usually the products of a manufacturing concern are sold in competition with other firms, but in the case of maintenance work a sum of money is laid aside to cover repairs and probable extensions, and there is not the same necessity for cutting down the work to be done if a depression comes, as the money has been budgeted for. Estimating is done on a time basis for the work done plus the value of the goods installed; the oncost which the costing department has fixed

WORKS REQUISITION No. :—123.

JOB No. :—2000/37. DATE :—2.2.37.
CHECK No. :—235.

MATERIAL.	COST.
1—7½ h.p. Sq. C. Elect. Motor	£15 0 0
T. Smith : Foreman.	

Fig. 1

should also be allocated to maintenance. The latter includes upkeep of the buildings, lighting, power and salaries of the maintenance staff.

Costing is the process of summing up all the above items and arriving at the exact cost of production, whereas estimating involves the determination of the probable cost of each separate item. For example, a machine may require an electric motor to drive it and the plant engineer is called in to estimate the probable cost of doing so before proceeding with the work. Into his calculations has to be taken not only the cost of the motor, starter and distribution board but also the possibility that the cables supplying the point in question may be running at full capacity.

Costing and estimating are bound up in each other, but it is impossible to estimate without some previous knowledge of the costs.

Labour charges are those sums actually paid as wages to the

WORKS CREDIT NOTE No. :—25.

JOB No. :—2000/37. DATE :—5.2.37.
CHECK No. :—235.

MATERIAL.	COST.
50 yds. 7/.036 V.I.R. Cable	£1 10 0
T. Smith : Foreman.	

Fig. 2

men who do the work, material charges those paid for the material used, be it an electric motor or a small switch, while establishment charges comprise a proportion of the staff salaries, rent and taxes. These charges are added together and a record of them can be kept in an indexed folder for each job for future reference for similar work.

Thus, if for "A" shop the cost of completely rewiring and bringing the lighting up to date is £"x" and the size of the shop is "p" sq. ft., then to give the same amount of lighting in "B" shop, which is "2p" sq. ft. in area, it is reasonable to estimate that the cost will be £"2x." As a further example the cost of installing 100 yd. of 0.3 sq. in. paper-insulated lead-covered single-wire armoured cable is £"xj" and it is required to lay 200 yd. of 0.1 sq. in. cable of the same kind, then the probable cost will be £"2y," since the same amount of labour is required in each case.

Labour is usually paid on a time basis for a 47-hour week

JOB No. :—2000/37.		LABOUR	MATERIAL
7½ h.p. Motor		.....	.....
7½ h.p. Star Delta Starter		.....	.....
25 yds. 7/.036 V.I.R. Cable		.....	.....
Etc.		.....	.....
Remarks :—	Labour	.....	.....
	Material	.....	.....
	Oncost	.....	.....
	Total	.....	.....

Fig. 3

(very few maintenance men are paid on a bonus system). Every job put out is given a number by the issuing office and the workers are provided with a daily time sheet. These sheets are filed in the office and from them the number of hours which are worked on a job are reckoned up. If the rate of the worker is 1s. 6d. per hour and he is twenty hours on the job which consists of putting up several outside lights and a fuse board, the total cost of erection is 30s. If 600 ft. of tubing are run the cost per foot run is 6d., including erection of the sub-main board. This unit charge is noted down in the plant engineer's cost record book.

Every consignment of goods, whether of raw materials or finished products, is always accompanied by an invoice which states the cost of the material. In the case of the motor referred to, the material cost includes the motor, the cable, the

COST RECORD BOOK SHEET.

DESCRIPTION.	PRICE	DATE	DELIVERY
Starter 5 h.p. AΔ ...	£12 10 0	1-3-37	Ex Stock
Starter 10 h.p. AΔ ...	£15 0 0	1-3-37	1 Week

Fig. 4

fuse board, the starter, cable and the clips for cables and other details required to make a complete job. The fuse board will have spare ways in it for possible extensions, but only a proportion of its material cost is allocated to the installation of the motor.

Any material required on a job must be obtained by an order on the stores, known as a "works requisition" (fig. 1). What is not used should be returned to the stores with a works credit form (fig. 2), and the job is then credited with the value of the unused material.

These requisitions and credit notes are passed to the costing department. The foreman of the maintenance section should be careful to draw only the amount of material required, otherwise the stores will in time accumulate number-

less odds and ends which may be useless in subsequent working. These are usually not noticed till the annual stocktaking when the material must be sold at a loss to scrap dealers. The records of labour and materials are kept as a record in an index in a loose-leaf book. (fig. 3).

In addition to these "works costs" this leads up to the subject of establishment charges or works overhead. Maintenance itself is in many places considered to be a works overhead charge, but if the matter is looked into more closely it will be seen that there are charges which must be borne solely by the maintenance department, for example, the wages of the foreman, office work, and electricity consumed for lighting and heating. The oncost for the maintenance and installation section of a factory should not be so high as that for the whole factory, as it ought not to bear the charges of the sales staff. This only happens if each department of the factory has its own oncost or in a manufacturing company which does not produce engineering goods, but which carries a small engineering staff to deal with maintenance. The overheads of a maintenance section are, for instance, totally different from those of a cotton-spinning department, and the purchaser of the finished goods does not expect to have to pay for the installation of new plant except in a very indirect way.

To the maintanance and installation department the main parts of the works is really the customer, and the oncosts will be the value of capital charges on the tools and machinery and depreciation, the power to drive the machines, the foreman's salary and labourers' wages. For example, suppose the repair shop takes up one-fortieth of the total area of the factory and the total rental of the works is £400 per annum, then the proportion which the repair department would bear would be £10. Let us assume that there are a foreman and 20 men employed on installation and repair working 47 hours per week, that the foreman is paid £250 and the labourer £104 and that £50 is allowed for power, depreciation and interest. The total of these charges is £414 over 50 weeks or £8.3 per week or approximately 2d. per man-hour as a shop rate to be added to the hourly rate of the worker to give the total cost of the job, together with the material and labour charges. Alternatively this charge of 2d. can be calculated as a percentage of the labour charges. Thus, if the wage rate is 1s. 4d. per hour, then 2d. is 12½ per cent. of this figure, which is added to the labour charges.

A good system in the hands of the plant engineer is most useful; thus the effect of a new or different workman on the cost of a job can be gauged.

In estimating the costs of details are required these must be indexed so that the outlay required for any particular operation may be determined. The engineer should have a good knowledge of the cost of materials and be kept in touch with the price of suppliers' goods by the order section so that his estimates may have a semblance of reality. The plant engineer's estimating book should be ruled as in fig. 4.

Labour charges are difficult to estimate. The best method is to compare the time taken on similar jobs and reckon up the cost at so much per hour. This, with the overhead charges, gives the total cost. Too much stress cannot be laid on the necessity for accurate estimating and costing, as sometimes a good deal depends on a cost or estimate whether a job goes on or not.

The Annual N.P.L. Visit

ON Tuesday about 2,000 scientists from all parts of the country had an opportunity of inspecting research in progress at the National Physical Laboratory. They were received by Sir William Bragg (chairman of the General Board), Lord Rayleigh (chairman of the Executive Committee) and Sir Frank Smith (director) in the hall housing the million-volt test plant.

Among the most popular of the exhibits staged was that for obviating risks of explosion in dry-cleaning works due to frictional electricity. Benzine is normally non-conducting but can be made so by the addition of suitable soaps which prevent the formation of electrostatic charges. About 5,000 V was obtained by running a cotton belt between pulleys, but this immediately fell to zero when the soap solution was added to the bath in which the belt was running. Another exhibit of electrical significance was the super-imposing of an artificial lightning flash (produced by the 2,000,000-V impulse generator) on a power current, with a view to investigating the value of devices for protecting transmission lines and towers from the effects of lightning strokes.

A cinema film of a street scene was shown in order to demonstrate the relative efficiency of the eye in light of different colours by ascertaining the time taken to notice the appearance or disappearance of objects of varying colours but with the same brightness. For measuring the amount of daylight penetrating into rooms, the laboratory has devised an instrument that makes use of two photo-electric cells and is not subject to errors of judgment on the part of the user.

Research carried out for determining the magnitude of eddy-current losses show that for hollow conductors of square section they are from 10 to 20 per cent. more than for those of circular section. Nevertheless, square hollow conductors have advantages that often outweigh the additional losses: when wound in coils they occupy less space; they can be built up of strip, angle or channels (which may be cheaper in large sizes); when building up the conductors, gaps may be left between the sides to improve heat dissipation, thus increasing current carrying capacity; and supports can often be more easily arranged. The work has been done on a theoretical and experimental basis and reliable formulæ have been obtained relating to isolated conductors, the single-phase system of two conductors and the three-phase system of three conductors, whether solid or hollow.

The time taken to determine the spectral transmission curve of a coloured glass or solution or to find the sensitivity curve of a photo cell or other light-measurement device can be considerably shortened by means of the new form of photo-electric spectro-photometer developed in the laboratory which was shown to the visitors.

Of interest to heating engineers is the study now being made in the Physics Department of the rate at which heat flows through double windows, in order to determine the best spacing of the glass panes and whether it is worth while to increase the number of panes above two. Here also apparatus has been developed for increasing the absorption of X-rays in various building materials. It has been found that 3 in. of barium concrete (a mixture of barytes and cement with or without sand) gives the same protection against X-rays of short wave length and gamma rays from radium as that afforded by 12 in. of ordinary concrete. In this department a noise meter of an objective type was being shown; in this a numerical value of loudness is given by the movement of a pointer over a dial and circuits have been designed to take account of intermittent noises.

In the Radio Department, four exhibits particularly called for attention. One was a portable self-contained direction finding receiver for wave lengths below ten metres; another was a self-checking direct-reading frequency-measuring equipment for a range of from 1 to 75 Mc per sec.; a third was a model providing for the automatic synchronisation of a pulse transmitter and receiver used for measuring ionisation at different levels in the atmosphere. The fourth exhibit consisted of coils and condensers of which the temperature coefficients do not exceed a few parts in a million per deg. C. In some the value can be controlled over a small range on either side of zero in order to compensate for a residual coefficient of the inductance; a small controllable temperature coefficient of capacitance for fairly rapid changes of temperature can also be secured.

[*Elec. Rev. photo.*

Sir Frank Smith, F.R.S., Director of the N.P.L.

The significance of this demonstration is connected with the frequency variations of uncontrolled valve oscillators which are due mainly to changes with temperature of the reactance of the coils and condensers used in the oscillatory circuits. In general the temperature coefficients of such components were found to be much larger than could be accounted for by simple thermal dilation, necessitating a special study of their nature and causes.

Researches in the Engineering Department have shown that fatigue resistance of some metals is considerably reduced by contact with the atmosphere; thus lead has only half the resistance in air that it has in vacuum, brass 80 per cent., copper 90 per cent. and mild steel 95 per cent. The cause is oxygen in the presence of water vapour. With salt spray the resistance of a steel was reduced to about one-tenth. Certain protective coatings on steels have given almost complete protection.

The Paris Exhibition. By S. H. Kahn

A lavish use of lighting

ELECTRICITY naturally plays a large part in the International Exhibition now being held in Paris; the total load is put at 53,000 kW. Lighting accounts for a good deal of this, but other equipment is responsible for a considerable amount.

The most important single installation is that of the fountains in the Seine, which the artists Beaudoin and Lods have designed with a view to combining in harmony water, light and sound. Altogether 203 groups of fountains have been built for this purpose, several different types being used.

A view of the Exhibition with the British Pavilion, opened by the Lord Mayor of London last Saturday, in the centre

The most important numerically, and of considerable interest technically, are the small fountains known as No. 1 and No. 2 built by the Jeumont Company, to the designs of its engineer, Monsieur Noel. Built to be submersible, they are composed of a tripod base to which a pump prolonged by a delivery tube is hinged. At the top is the fountain proper, consisting of the jets and floats. When submerged, the whole stands only about 2 ft. above the bed of the river.

The motor pump group is a Jeumont Vogel submerged operation type with a rotary pump with provision for avoiding drawing in mud and sand. The water is forced by the pump up to the top where it can be let into the nozzles. The fountain head itself is in a triangular frame of angle iron at the points of which floater tanks are placed. A sheet metal circle inside the frame supports the lights and the nozzles. Inside this are the lamps which in the No. 1 fountain are ten in number and in the No. 2 fountain 20. Five colours are provided. In the centre at the top of the pipe coming from the pump is a small distribution chamber from which tubes run to the hydro-ejectors of the floater tanks. From the water distribution chamber also pass the feeds to the nozzles. In the smaller No. 1 fountain these are grouped and consist of either one or several nozzles fixed directly to the distribution. In the No. 2 fountain, however, a secondary set of nozzles is arranged around the circular frame. Each of these sets can be separately controlled by means of an electric valve operated from the control board of the installation.

The "Mazda" lamps are of a type specially designed for operation under water. They consist of a glass bulb, the back of which is internally silvered to form a reflector, while the front is of a special lens shape which takes into consideration the refraction of the light rays leaving the surface of the water. The colour screens are held on to the lamps by spring fasteners.

The Nos. 3, 4 and 5 fountains are larger and are not submersible on account of the difficulty of leaving sufficient clearance above them when lying on the bed of the river. The frames are in the form of pontoons, and the assembly and all the electrical equipment is by Siemens. No. 3 is built up on ten watertight caissons measuring 2 metres by 1 metre by 0.8 metre. Two of these are provided with openings to accommodate the equipment for distant control. A submerged pump group of 33 kW with elastic coupling between the 3,000-r.p.m. motor and the pump supplies the water for all the effects. Starting is by contactors placed in one of the floats. The control of the effects is by four electromagnetic valves with distant control. These permit the use of either a single central jet of about 140 ft., four jets at an angle of 45 deg., or eight jets at 45 deg. with a span of about 140 ft. to give a "basket" effect.

The lighting is by twenty-eight 1-kW projectors in four colour groups, each group being separately controlled. Each projector is under water, with the colour filter placed inside the projector. They can be tilted so as to light either the top or the bottom of the fountain.

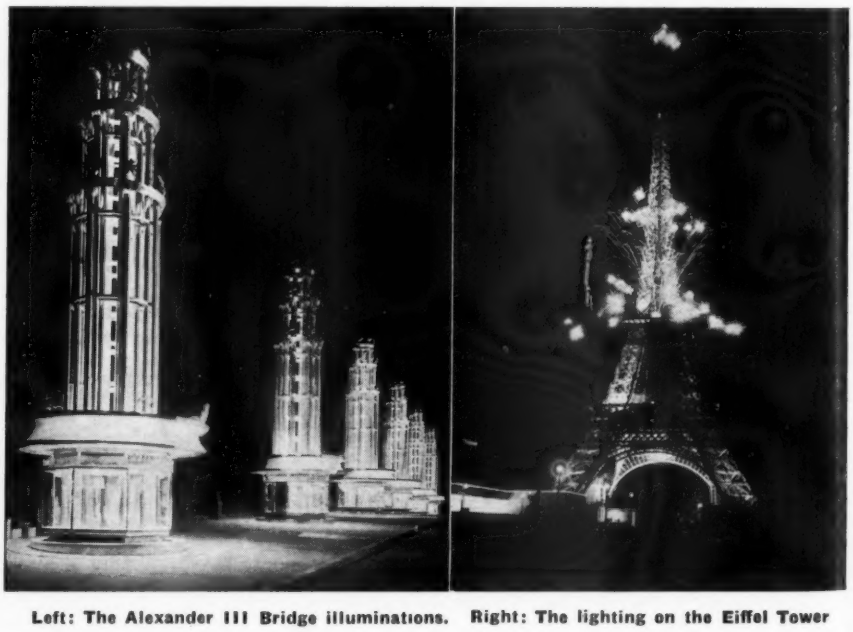
Fountains Nos. 4 and 5 are similar in design, but are provided with two motor pump groups, one providing spray and the other for the main jets which can reach 240 ft. The number of projectors is double that in the smaller group, and they are divided so that each colour can be turned on in two steps permitting a great variety of shades of colour to be obtained. They are built up on twelve caissons of the same dimensions as those used for the smaller fountains.

Each fountain is protected by a circuit-breaker with time relay to prevent its opening when the pumps are started up with the nozzles working. Each motor is further protected by an overload device, and lights indicate when the water leaking into them rises above the danger point.

Other pontoons are designed to permit smoke, water, froth, or balloons to be projected, with the necessary lighting effects. The smoke is produced by the use of titanium tetrachloride, which is forced through a flue by a ventilator fan operated by an 80-kW motor. Under proper atmospheric conditions this should reach over 325 ft. high. The smoke is neutralised by ammonia. On the air outlet a heater provides hot air for the filling of the balloons.

On the bridge of the pontoon are eight 5-kW and ten 2-kW projectors which are controlled in six circuits to permit a proper mixing of colours. On the bridge also is the froth jet connected to the motor pump and to a container of froth producing material.

Inside the hull are the ironclad controls, including the circuit-breakers for the various parts of the installation and the incoming feed cables. The operator receives his orders by telephone from the main control boat. Safety measures on the boat include gas masks against the smoke and an emergency lighting system operated from 12-V storage batteries.



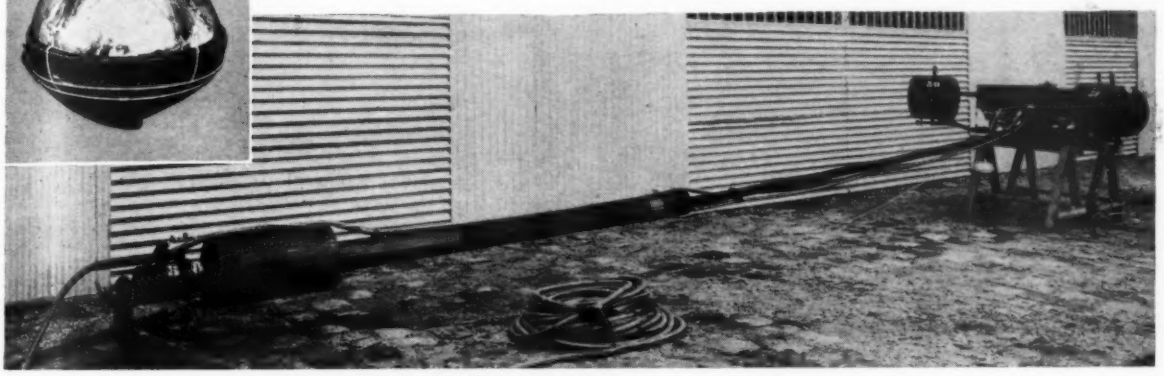
Left: The Alexander III Bridge illuminations. Right: The lighting on the Eiffel Tower

Two further boats provided only with lights are also included. Each of these is provided with a single arc light projector with a mirror 6 ft. 8 in. in diameter. The arc is of a semi-automatic type rated at 250 A 70 V. Each projector revolves around a vertical axis and pivots. The feed is by convertor groups, and the d.c. circuits are distant controlled by an operator on the main control boat by two 280-A contactors.

There is a series of fountains alongside the piers supporting the bridges across the river.

To combine with these fountains a system of musical diffusion is also provided for. This consists of a series of loud speakers mounted on pontoons and on the banks as well as a large loud speaker placed on the Eiffel Tower. All these circuits and their controls were produced by Le Matériel Téléphonique.

The installation provided for the fountains of the Trocadero Gardens is of interest. These are divided into nine groups, of which the most important is a mass of twenty jets at one end of the long basin, set to give a low curve of some 160 ft. span, the nozzles being set at an angle. To either side of this small statuary fountains are placed, as well as a pair of colonnades. Around and on either side also is a series of thirty-two fountains arranged in steps. In the long basin below are twenty-four fountains and twelve colonnades as well as ten lateral fountains which direct the streams from the sides towards the centre. Two cascades complete the effects. The lighting is by a series of portholes in the floor of the basins.



Jeumont fountain equipment with one of the special " Mazda " lamps inset

The sub-station comprises two groups of two 250-kVA transformers and six 100-kVA transformers. When the fountains and the lights are all on, these will be fully loaded: The transformers are designed so that there will always be one 100-kVA in service. The others are automatically cut in as the load increases and cut out when the load drops. There are 550 lights representing a total connected load of 700 kW. Each light is placed in a parabolic reflector, which is set inside a revolving hexagonal frame bearing the various colour filters The frames can be revolved by servo-motors controlled from the main control board, so that any desired colour filter can be brought into position. It is possible, moreover, to stop the filters when there are two in position over the light, so that a wide series of colour combinations can be obtained.

The operation of the fountains is in a closed circuit and represents a very considerable volume of water. The large end fountain, for example, has a flow of over 100 gallons per second; while the total water flow is about 625 gallons per second. The loss of water during operation is made up by an automatically controlled inlet which admits fresh water to the reservoirs as rapidly as it is lost and keeps the level constant. In case of rapid loss of water for any reason, the pumps are cut out automatically as the water level falls below a fixed point.

An interesting feature of the installation is the addition of about 100 kW of "Wood's " lamps. These are installed above the surface of the water to either side of the basin and are operated separately by control buttons. The water is given a blue luminescence by the addition of suitable chemicals. The effect is as though the water itself were the source of light. Occasional points of ordinary coloured light afford contrast with the blue tone. The whole of the installation was by C.E.L.I.

The third important electrical installation is that of the Eiffel Tower. This has been designed by the architect Granet. The structure itself lends itself to extremely interesting effects which are obtained by the use of a series of 600 Philips projectors of 1-kW each which are fixed to the framework of the tower at various points of the interior. These projectors are of the weatherproof type and are provided with interchangeable colour filters. They are arranged so that the frame of the tower will stand out against the light. Underneath the tower in the top of the arch some six miles of gas-discharge tubing has been placed in geometrical designs in a pale peacock blue tone which has been especially made for the occasion by André Claude. These are reflected in a basin which has been installed under the tower.

On the first platform of the tower a series of 28 marine-type Barbier Besnard projectors have been placed. These are lighted by the use of high-pressure water-cooled mercury lamps. The controls for each of these projectors is built into the projector itself, with distant operation from a switchboard. These include the water pumps for the distilled water circulation for cooling and the contactors for the lamps. Contactors and water pumps are interlocked in such a way that the lamps cannot be lighted until the water is in circulation. On the second platform sixteen projectors of the same type are placed, while a further eight are set on the top.

Another installation which, if it represents a less considerable connected load, is none the less extremely effective is that which Philips have built along the Alexandre III Bridge to the designs of Henri Favier. This consists of a series of twelve aluminium towers, the lower part of which forms a wide base of octagonal shape, surmounted by tall aluminium tubes. A high-pressure mercury lamp projector is placed in the centre of the cluster of tubes, lighting them from the bottom, and a series of incandescent lamps is placed around the outer edge of the base. The windows contain large photographs showing the various stages of the manufacture of lighting and radio equipment lighted by projectors. In the interior of the base a loud speaker has been installed.

A High-voltage Laboratory in China

THE electrical department of the Tsing Hua University, Peiping, has recently had built a modern high-voltage laboratory, the equipment of which was supplied by the A.E.G. Co. A single-phase testing transformer rated at 35 kVA at 250 kV, 50-cycles, one pole being solidly earthed, is energised from the local a.c. mains through a regulating auto-transformer, the primary of which is wound for 220-V and the secondary for fine-stepped regulation from 0 to 440-V. The regulating transformer contains a main winding divided into four equal sections, and an additional winding whose full voltage equals that of each section. The additional winding is provided with numerous tappings, which lead to a selector switch resembling a commutator. The main sections are automatically switched in and out during operation of the fine regulation switch. High voltages are measured by a precision spark-gap with 10-in. spheres arranged vertically. Motor remote control serves to vary the height of the lower sphere, the upper one being fixed. Surge equipment for research up to 230 kV consists of two condensers enclosed in bakelised paper, each of 0.178 μF (16,000 cm) capacity. They are charged in parallel, then connected in series by a switch and discharged *via* a trigger gap through the apparatus under test. The condensers are charged at 115 kV, d.c., obtained from a portable hot-cathode rectifier. The filament heating current is supplied by a motor-generator with insulated shaft. Variation of filament voltage is obtained by adjusting the speed of the motor-generator. High damping and discharge resistances are arranged in the surge circuit in order to give the impulse waves the desired form as regards equivalent building-up time and half-crest duration. These adjustable water resistances consist of two copper cups, each of 300 c.c. capacity, mounted on insulators, forming the electrodes. A second rectifier with two valves supplies high-voltage d.c. for travelling wave tests. The valves can be connected in parallel or for half-wave, full-wave, or voltage doubling, in the latter instance providing a maximum of 150 kV. Regulation of the filament voltage is effected by sliding rheostats in the primaries.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Earthing Cookers

The majority of cookers hired out by undertakings are fitted with plug-in elements. When these are new I have found the resistance between the earthing pin and the element casing to be within the safety region of 0 to 0.5 ohms. After a fairly short period in service this resistance may increase to an extent which permits a leakage current to remain on the face of the element casing. While this leakage is not sufficient to give a severe shock it may be enough to cause a nervous person to upset a utensil of boiling liquid if a shock is received *via* the vessel's handle. The consequent liability would undoubtedly be on the supply authority.

The high resistance is due to the forming of a non-conductive film between the bolting of the earth pin and the element casing, created by heat expansion and contraction. The only remedy would be to weld an earthing tail direct to the element casing and bolt the end of the tail to a point on the cooker where the connection would not be subject to high temperature.

East Ham, *June 18th.* W. E. BUCKLE.

Earth Leakage Protection

In reply to Mr. Gilbert's letter in your issue of June 18th, any leakage trip can be connected either by a single earth or by the parallel method. I stated in my letter that the Home Office recommended the parallel method, a fact which Mr. Gilbert can easily verify, as I did, by asking the Home Office, and numbers of leakage trips have been installed in this way.

I presume that Mr. Gilbert now understands from my last letter how a leakage trip (connected by either method) can be rendered inoperative by accidental contact between the earth wire and other parts of the earthing system. I should like to add that I know of cases where this has actually occurred. THE WRITER OF THE ARTICLE.

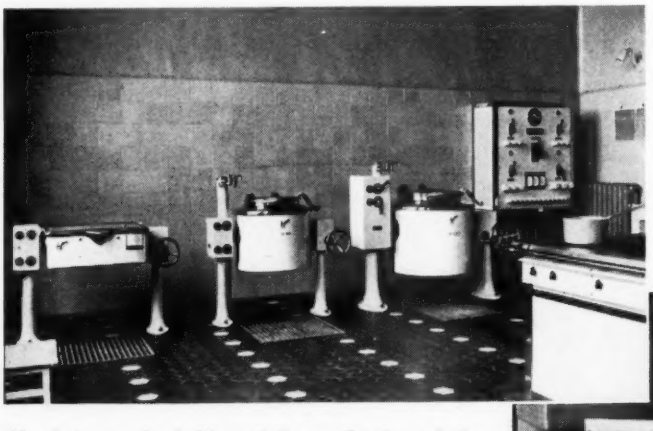
June 19th.

With regard to Mr. T. C. Gilbert's letter in your last issue, the plain fact is that I.E.E. Regulation 1,005 (C) does not apply in Germany and is intended to provide protection under British operating conditions which must be met by apparatus makers and designers concerned with the home market. To illustrate this point I have just made a test with a German make of earth-leakage trip switch connected as required under this Regulation, i.e., as a supplement to the main earthing. This switch failed to act under the conditions described in the article criticised by Mr. Gilbert. This does not reflect in the slightest upon the efficiency of the German switch, but it does prove the necessity for precautions against accidental shunting of the trip coil.

Mr. Gilbert suggests that some authority can interpret Regulation 1,005 (C) as meaning that an earth-leakage trip may be connected in series with the main earth. I cannot agree that the trip would then supplement the main earthing; a more obvious effect would be that what was previously the main earth wire had become part of the trip-coil circuit. This would be a single form of protection, whereas "supplementary" clearly means "additional." Risks from a shunted trip coil (which apparently have not to be taken into account in Germany where dual earthing is not required) must therefore be recognised.

The Continental earth-leakage trips appear to be in general use in areas where it is usual for neutrals to be multiple-earthed, the result being that the earth resistance in the trip circuit is reasonably low. The 500 ohms earth resistance value appears to be considered the maximum likely to be experienced there, for which 42 V maximum is stipulated. In this country it is usual for neutrals to be earthed at one point only, with the result that earth resistance values, especially in rural areas, can and do reach values between 15,000 and 20,000 ohms when a really dangerous voltage cannot energise the trip coils. Under such conditions the German type of trip switch is useless, although satisfactory under operating conditions in that country. A. G. BULLEN.

Liverpool, *June 19th.*



Two views of the well-arranged electric kitchen of the Opera Pia Taparelli di Saluzzo with a total connected load of 50 kW (See page 978)

The Cost of Patents

Referring to the article on "Patents, Designs and Trade Marks" on page 772 of your issue of May 21st, it is interesting to compare the attitudes of the British and American Governments towards inventors. In the report of the United States Patent Office for the year ending June, 1934, reference is made to the increase in fees and the following is an extract from the report:—

"These increased fees, constituting a severe burden on inventors, were justified when enacted, as they can only be justified to-day, as a means of providing sufficient revenue to enable the Office to render that high character of service demanded by inventors and industry. . . . The higher fees were not imposed with the thought of creating an additional source of general revenue for the Treasury."

The British Patent Office has not only increased the fees but makes a profit of nearly a quarter million pounds annually, which is diverted to the Treasury instead of being used to relieve the patentee of some of his financial burdens.

London, S.W.1, *June 18th.* G. DRURY COLEMAN,
General Secretary,
Institute of Patentees.

The Reorganisation Proposals

Few, I think, will disagree with Mr. Wilson's views on the proposed reorganisation, but I also think that the suggestion that further powers should be conferred on the Electricity Commissioners amounts to speculation—of which there has been far too much already—and would probably lead to still greater chaos. Not everybody believes that the supply industry is in a sad way or that unless reorganisation is introduced along the lines of the "White Paper" the industry stands in danger of having to put up the shutters, as seems to be suggested.

Isn't the truth of the matter that a few theorists have a paper scheme which they would like to inflict upon the nation without any regard to practical or financial considerations? Isn't is true that there is no need whatever to turn the industry upside down in order to get a move on; also, that there is no need for a policy of merging in a hush-hush manner

and that the panic is to be heard outside the industry and not within it? On the other hand, isn't there a pressing need for removal of interferences and obstructions which bar the way to progress along the desired lines?

Given uniform bulk supply charges from the grid the abolition of transmission oncosts to non-selected station owners, and a halt in the number of rules and regulations which force tremendous expense upon the supply authority there is no apparent reason why the question of uniformity of retail tariffs should not be approached. A White Paper—without any clumsy attempt to stifle legitimate criticism in advance—dealing with proposed Tariff Boards or Consumers' Tribunals could easily have brought about the desired end and have helped matters forward very considerably. That, however, is a business suggestion, not a political one, which is quite another matter. Surely, if electricity supply is so far behind the Government programme, or if there is any truth in the suggestion that half the population are anxiously awaiting connection to the mains, the proper solution of the problem lies in increasing—not decreasing—the number of distribution authorities—in other words, speeding up delivery. But are the technical and commercial considerations behind the proposals not entirely subservient to the political considerations?

As a shining example of what is meant, consider the two groupings in which the Manchester and Salford Corporations are placed. It is always difficult to know just where Manchester begins and Salford leaves off, but the White Paper suggests that nothing would be gained by grouping these two undertakings together, they must each remain as separate units in two newly constituted groups. The reason, I think, is that the opposition might prove to be so very powerful as to cause political embarrassment. The same remarks apply with greater force to the proposed grouping for Yorkshire. Here the Power Company would presumably operate over a large area, to the common good, leaving cities like Leeds and Bradford and other large towns divorced from all the advantages claimed for the proposed grouping. Why? Partly because the advantages claimed amount to political propaganda and partly because no Government would dare to attempt to force such powerful authorities to sell themselves to a power company. But the difference between the case of the larger and the smaller authorities is a matter of degree and not of principle and the smaller authorities must also be ready to show that their political opposition is not to be measured by the number of units they sell, but by the same principle.

Despite all that has been said in high and low places about the supposed "defects" of the existing system, the outstanding fact is that electricity supply authorities have made their service so popular and desirable that everybody wants it and thus far only half have got it, and what is more to the point, the bulk of the have-nots are to be found in the larger towns and cities. The "White Paper," however, is more concerned with getting rid of the "little-uns" than in providing ways and means of speeding-up the work of the larger authorities.

Those in the know are fully aware that the little-uns, in the majority of instances, have something to show the big-uns when it comes to questions of development. My own undertaking is but an ordinary example of the small undertaking, but it has connected something like 88 per cent. of the premises in the area. This year it will probably sell rather more than four million units, which is equal to 450 units per head of population, at an average price of 1.2d. With a bulk tariff equal to that enjoyed by many of the larger authorities the average price obtained could drop to ¾d. per unit, which goes to show that the retail tariffs must always be considered as relative, because of necessity they must reflect the prices of bulk supply.

I think that it would be for the good of the industry and everybody connected with it if the Government was to do a little stocktaking to discover whether or not it was in the public interest to extend the powers of the Electricity Commissioners. Judging by the present upheaval it would seem that their functions should be defined with a little more circumspection than has been thought necessary heretofore, and their powers circumscribed in a decisive manner.

JAMES RATCLIFFE,
Engineer and Manager,
U.D.C. Electricity Dept.

Whitworth, Lancs, *June 19th.*

Rotating Vectors

Mr. Carter's letter of June 11th further shows how complicated is the definition of the action of j on the $\sqrt{-1}$ basis. To go from $+1$ to -1 we move along the x axis from right to left and then by taking the square root of -1 we rotate the vector either forwards or backwards through 90 deg. Subsequently multiplication by j produces only a forward movement. The whole process is confused and illogical, and the fact that it has existed for a long time does not make it right.

The way out is obvious. If one goes from $+1$ to the vertical position by multiplying by j, and then to -1 position by a further multiplication by j, we ought to go from $+1$ to -1 by rotation of the vector. Once we agree to this convention the whole thing becomes clear. The initial position is 1^0, $j=1^{1}/_{4}$, $-1=1^{1}/_{2}$, $-j=1^{3}/_{4}$, and 1^1 is a complete revolution, as I set out in my letter of June 4th.

The unit angle becomes a revolution, shortened to rev, and this may be divided into 1,000 milli-revs. One has only to multiply the milli-revs, by 0.4 to reduce them to grades when the centesimal tables apply. The rev. method fits in with vectors and vectorial calculations and also with practical engineering, as engineers always think in r.p.m. A very neat demonstration of De Moivres' theorem follows. 1^a is a vector of one unit in length rotated through an angle (say) of θ, and 1^{na} through an angle of $1^{na}=n\theta$. Expressed in cartesians $1^a=\cos\theta+j\sin\theta$ and $1^{na}=\cos n\theta+j\sin n\theta$. But $1^{na}=(1^a)^n$ so that $(\cos\theta+j\sin\theta)^n=\cos n\theta+j\sin n\theta$. The problem of finding the roots of unity is also solved, but one sees that the different roots spring from different premises, as 1^1 is not identical with 1^0. Much simplification and clarification of vectorial calculation follows.

C. TURNBULL.

Tynemouth, *June 21st.*

[In regard to the letter on "The Checking of Two-Part Tariff Meters" from Messrs. H. Leaver and E. Pilling, published in our issue of June 18th, the diagram was not quite complete. The connections to the middle meter switch should, of course, have been similar to those of the two other meter switches shown.—EDS. ELEC. REV.]

New Books

Utilisation of Electric Energy. By E. O. TAYLOR. Pp. 342: figs. 148. London: English Universities Press. Price 21s. net.

One of the problems facing a young man emerging from a technical college and finding himself in the workaday atmosphere of the electrical industry is to reconcile his academic knowledge of the various fundamental principles involved with the actual methods with which these principles are applied for practical use. The ever-widening field of technical knowledge which has to be covered in colleges to-day makes it all the more difficult to show students how far pure theory has to be modified in practice.

In this volume the author, himself a lecturer at one of our leading technical colleges, has made a material contribution towards preparing the minds of students approaching the end of their course to face practical problems in the application of the principles they have learned. The ground covered is very comprehensive. Thus, over one hundred pages are devoted to the important subject of ordinary industrial electrical drive, its control and application.

Other chapters deal with electric traction, including train, tram, trolley-bus and Diesel-electric equipment; the various types of heating, furnace and welding equipments; electrolytic processes including extraction and refining of metals, electrodeposition and manufacture of chemicals. Two other interesting sections are one dealing with illuminating engineering with its industrial and street lighting applications, and a concise exposition of some of the economic aspects of application. Reference is also made to the various regulations affecting the utilisation of electrical energy.

A useful bibliography has been collated, to which the reader is referred for greater detail of any of the particular sections covered in the work. Such mathematics as has been introduced, is not above the standard which would be reasonably expected in a student in his final year at college. Another useful feature is the worked-out examples of problems and the large number of questions, the answers to which are given at the end of the volume.

This book should be of use not only to the student about to enter on his practical career, but also to the seasoned engineer.

Shorter Notices

"The Relative Advantages of Heating by Coke, Gas and Electricity," a recent Chadwick lecture by A. H. Barker, B.A., B.Sc., M.Inst.C.E., has just been published, together with another lecture on "The Modern House and its Equipment," by R. Randal Phillips. The booklet (pp. 42, price 1s.) is published by P. S. King & Son, Ltd.

There are many electricians who use a motor cycle as a means of conveyance to and from the place where work is being carried out, and they will find that running costs can be reduced considerably by carrying out their own repairs, which can be done easily with the aid of "The Motor Cyclist's Workshop," by "Torrens" (Iliffe & Sons, 2s.), a second edition of which has just appeared. Many of the tips of a general mechanical nature, such as those on soldering, bushing, bearings, pipe-bending, &c., can be applied also in the electrical field as the proper use of workshop tools is fully explained.

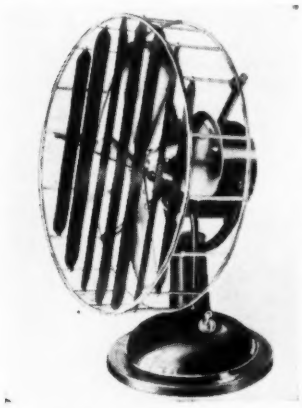
D

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

An Unusual Fan

The orthodox design of oscillating fan needs a certain amount of room for operation. With the new "Deflectair" fan, however, instead of the whole fan body oscillating, deflectors or vanes in front of the fan are moved by a specially designed gear box driven from the rotor shaft, the fan body and guard remaining stationary.



The "Deflectair" fan

The vanes oscillate over 90 deg. and no damage can result should the vanes meet any obstruction as a slipping clutch is provided in the gearing. A simple adjustment enables the vanes to be made to oscillate either vertically or horizontally, thus directing the air from side to side or up and down.

The blades are 10 in. long and the speed is 1,500 r.p.m., the loading of the motor being 40 W. The fan weighs 8¾ lb. and is made for a.c. supplies at 200/250 V by FALK, STADELMANN & CO., LTD., 83-93, Farringdon Road, London, E.C.1.

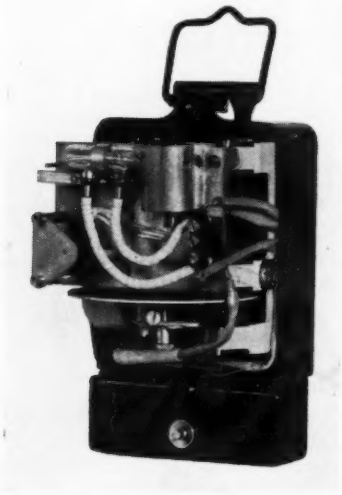
A Steam-electric Iron

Ironing is claimed to be simplified and the risk of scorching eliminated by the use of the new "Eagle" steam-electric iron produced by EASIWORK, LTD., 242, Tottenham Court Road, London, W.1. Neat in appearance, the iron weighs only 5 lb., and incorporates in its body a brass tank containing water, which passes out in the form of steam through slots in the bottom of the sole-plate, thus ensuring correct dampness for ironing.

Recesses in the base-plate allow ironing under buttons without damaging them, and a handle of attractive design and colour protects the hand from the heat. Chromium-plated brass is used for the body. The loading is 350 W.

A.C. Motor Protection

A relay for preventing damage to a.c. motors from sustained overloads below the values at which circuit breakers or fuses would be operative is being manufactured by LLEWELLIN'S MACHINE CO., LTD., King Square, Bristol. It consists of an induction disc rotating in the field created by current and voltage coils and between the poles of an electromagnet, which provides the requisite torque at low speeds. The spindle carries an eccentric which imparts reciprocating motion to a pawl driving an irreversible ratchet wheel with which it engages when the current operating a solenoid exceeds a predetermined value. In that case an arm on the spindle of the ratchet wheel releases a catch at the end of its stroke (*i.e.*, the period for which the relay is set) causing a mercury switch to tilt, thus cutting off the supply to the motor.



A relay for preventing damage to a.c. motors

If the current decreases before the end of the stroke, the plunger drops and disengages the driving pawl from the teeth of the ratchet wheel, allowing it to reset itself for the next operating cycle.

For motors taking up to 5-A or so at full load the mercury switch can be connected directly in the motor circuit. For larger currents it may be connected in series with the no-volt coil or else it may be arranged to close when the relay operates so as to energise the trip coil of a circuit breaker. For single-phase motors a single relay only is required; for three-phase machines two are preferable.

A Long-scale Demand Indicator

A maximum demand indicator (type H.S.I.) has been specially designed by the P. & B. ENGINEERING CO., LTD., Tamworth Lane Works, Mitcham, Surrey, for consumers' installations when a longer scale is required than is usually available with thermal indicators of the pointer type.

The whole of the movement is flexibly mounted in order to render ineffective any attempt by a consumer to tap the pointer to a lower reading and to prevent the pointers moving either upwards or downwards due to vibration or accidental blows on the case.

The P. & B. long-scale demand indicator

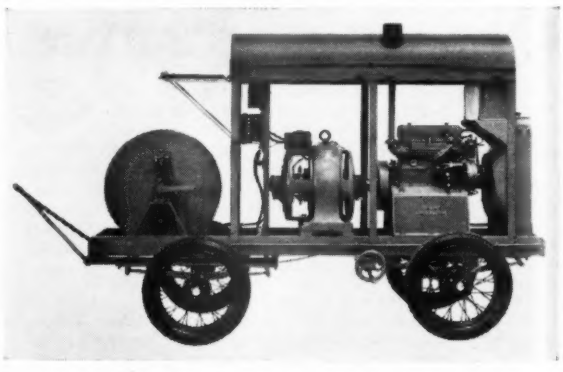
The movement is the standard P. & B. type with only one moving part, except for the maximum pointer, and has no pivots, levers or multiplying mechanism. The indicator is available for direct connection in any capacity up to 50 A and is scaled for an allowance of 20 per cent. overload. The scales are all individually drawn and may be in amperes, kVA or in special units as required. The time lag is either 15, 20 or 30 min.

Before despatch all indicators receive a final test and none is passed which shows an error of more than 3 per cent. No rubber or organic materials which are liable to deteriorate are used in the construction. The overall dimensions are 8¼ in. high by 5¼ in. diameter by 5 in. deep.

Portable Generating Sets

Portable generating sets represent an economical solution to the problem of keeping fully charged the batteries of a number of telephone exchanges. Being portable and mounted on pneumatic tyres with standard automobile-type wheels, and fitted with automatically and alternatively hand-applied brakes, the new sets made by the PARSONS ENGINEERING CO., LTD., Town Quay Works, Southampton, can be towed at a high speed from one exchange to another.

The power unit is a standard Parsons D4S petrol engine giving 15 h.p. at 1,500 r.p.m. and capable of handling an output up to 7 to 8 kW maximum. The electrical end consists of a shunt-wound battery charging type generator made by the Electric Construction Co., Ltd., having an output of 75 A at 46/47 V. At the end of the generator is mounted a switch panel equipped with shunt-field regulator, voltmeter and ammeter, and, farther forward, a cable drum carrying a length of flexible c.t.s. cable. This drum has been designed specially with internal connections to one end of the cable, which is wound on, and connection from the set is made by wing nuts on the outside of the drum, which couple up the main cable. These are disconnected, of course, when the drum is unwound and coupled up again as soon as sufficient cable has been laid.



The Parsons portable charging plant

The plant, with the exception of the cable drum, which is weatherproof, is completely enclosed by fitting steel side doors to the roof, the flap at the forward end (shown raised in the illustration for observation of the meters) being closed, and the space below it is permanently sheeted in.

We regret that the illustration of the staircase switch by Time Switches & Instruments, Ltd., described last week was inadvertently published upside down; the scale should, of course, be at the top.

British Overseas Electrical Trade

Further substantial exports of goods and apparatus

THE Board of Trade return of overseas trade for May shows that there was an advance of £314,201 (27 per cent.) in the value of our electrical exports as compared with May, 1936, which contained two extra working days. From an analysis of the figures it is evident that this satisfactory state of affairs is largely due to a continuation of the recent substantial shipments of goods and apparatus; electrical machinery exports, although on the whole exceeding in value those in the corresponding month of last year, have declined since February.

Much of the improvement in exports of electrical goods has been due to the growing requirements of the Australian and New Zealand markets. In the case of the former country the following figures are impressive: January, £138,887; February, £140,600; March, £149,753; April, £171,707; and May, £202,287. With investigations going ahead into the New South Wales Government's £12,000,000 electrical development scheme, the projected construction by the Victoria Electricity Commission of a 200,000-kW hydro-electric station on the Kiewa River, and other important works, Australia should become an even more fruitful market for British manufacturers. During the past five months electrical goods and apparatus shipped to the Commonwealth have amounted in value to £800,902, as compared with £855,403 in the case of our best customer, South Africa. Although the total is less, the figures for New Zealand denote an even more rapid expansion, the value of shipments during the past five months being £426,309, as compared with £236,677 in the corresponding period of last year.

With minor exceptions the improvement in exports of goods last month extended to all classes. Insulated wires and cables, other than telegraphic and telephonic, reached a new high level at £313,443, an increase of £122,202. The following indicates the chief destinations of such exports, with values for last month and, in parentheses, May, 1936. It is seen that in the case of wires and cables with insulation other than rubber shipments have doubled in value:

Rubber insulated wires and cables:—Australia, £37,324 (£28,925); South Africa, £35,598 (£32,087); British India, £14,217 (£10,827); New Zealand, £6,376 (£4,633); other British countries, £19,012 (£13,173); and foreign countries, £18,679 (£9,687).

Electric wires and cables, insulation other than rubber:—Australia, £56,205 (£25,817); South Africa, £40,718 (£31,195); British India, £24,510 (£11,160); other British countries, £32,540 (£11,283); and foreign countries, £28,264 (£12,454).

There was also a substantial improvement in exports of telegraph and telephone apparatus, for which Australia, Argentina and certain other British countries were responsible, as the following analysis shows:

Telegraph and telephone apparatus, other than radio:—Australia, £55,012 (£19,951); South Africa, £15,101 (£28,969); Argentina, £9,100 (£19,190); other British countries, £78,401 (£27,152); and other foreign countries, £36,599 (£38,264).

An additional 26,500 radio valves and 457,000 electric lamps were exported last month, the value of lighting apparatus sent abroad increasing by £17,295 as compared with a slight drop in similar imports. Shipments of electric cooking and heating apparatus were also of a higher value, although the extent of the increase here would probably only just cover the rise in prices. In the machinery section, motor exports make the best showing with an aggregate weight for the month of 926 tons against 525 tons in May, 1936, the respective figures for generators being 420 and 396 tons. Exports of other machinery decreased in weight from 1,203 to 1,063 tons.

EXPORTS AND IMPORTS DURING MAY

	Exports. May, 1937.	Exports. Inc. or dec. compared with May, 1936.	Imports. May, 1937.	Imports. Inc. or dec. compared with May, 1936.
Submarine telegraph and telephone cables	£5	— £3,520	*	—
Telegraph and telephone wires and cables (not submarine)	80,618	+ 32,840	*	—
Other insulated wires and cables	313,443	+ 122,202	£43,017	+ £1,256
Radio receivers, not radiograms (excluding valves)	28,298	+ 13,493	13,021	— 7,109
Radio transmitters (excluding valves)	18,387	+ 212	*	—
Radio valves	34,393	+ 3,317	24,383	+ 12,124
Other radio parts and accessories	46,744	+ 15,285	103,350	+ 55,087
Telegraph and telephone apparatus (other than radio)	194,213	+ 60,687	*	—
Electric carbons	*	—	15,129	+ 4,247
Incandescent lamps	55,511	+ 8,351	13,645	+ 1,068
Other lighting apparatus	47,247	+ 8,944	36,759	— 2,631
Primary batteries	15,527	+ 1,538	*	—
Accumulators	50,352	+ 11,180	*	—
Electric cooking and heating apparatus	30,374	+ 5,222	*	—
House service meters	13,847	— 1,458	*	—
Other electrical instruments	17,944	+ 2,296	23,801	— 180
Unenumerated electrical goods and apparatus	126,230	— 769	71,460	+ 1,667
Electric generators up to 200 kW	26,516	+ 603	*	—
Electric generators over 200 kW	41,874	+ 7,976	*	—
Electric motors	114,725	+ 42,699	35,486†	+ 2,127
Converters and transformers	51,623	— 3,625	*	—
Starting and controlling gear for motors	35,676	— 6,450	*	—
Switchgear	94,340	+ 1,102	*	—
Other electrical machinery	10,444	— 1,059	17,416	+ 5,353
Electric vacuum cleaners	18,265	— 7,384	15,990	— 2,674
Total	£1,465,696	+ £314,201	£413,457	+ £70,335

* Not classified separately. † Not railway and tramway motors.

Electrical imports last month at £413,457 exceeded the May, 1936, amount by 20 per cent. The deviations in value of the various items were not extensive except in the case of radio apparatus, which accounted for £60,102 of the total rise of £70,335. The United States benefited most from the increase in imports, as the following analysis of the chief sources reveals:

United States, £106,210 (£68,493); Germany, £77,968 (£70,349); Netherlands, £65,711 (£45,165); Belgium, £17,733 (£23,013); Switzerland, £16,161 (£17,731); France, £9,951 (£7,109); Austria, £4,654 (£4,089); other foreign countries, £25,479 (£29,033); and British countries, £20,698 (£14,054).

So far this year British exports of electrical equipment have attained the value of £7,188,291, representing an increase over the corresponding five months of last year of £1,163,542, or 19 per cent. Imports have risen in value by £340,916 (21 per cent.) to £1,970,036. The growth of our electrical exports up to the end of May last year was £584,146, or 11 per cent., while the corresponding figures for imports were £282,019 and 21 per cent.

BRITISH ELECTRICAL EXPORTS DURING MAY

Destination.	Goods and apparatus, May, 1937.	Inc. or dec. compared with May, 1936.	Electric generators, May, 1937.	Inc. or dec. compared with May, 1936.	Electric motors, May, 1937.	Inc. or dec. compared with May, 1936.	Other electrical machinery, May, 1937.	Inc. or dec. compared with May, 1936.
Irish Free State	£39,379	+ £14,643	*	—	*	—	*	—
Channel Islands	16,212	+ 6,254	*	—	*	—	*	—
Union of South Africa	167,568	— 7,855	£3,219	— £10,443	£28,399	+ £15,318	£58,662	— £3,136
British India	120,276	+ 26,653	12,253	+ 5,776	11,791	— 1,433	32,714	— 15,279
British Malaya	29,202	+ 8,262	*	—	*	—	7,995	— 2,931
Ceylon	6,150	+ 311	*	—	*	—	*	—
Hong Kong	4,639	— 25	*	—	*	—	*	—
Australia	200,287	+ 84,163	4,158	— 14,665	15,041	+ 6,239	22,867	— 771
New Zealand	96,746	+ 54,575	*	—	7,811	+ 6,107	9,734	+ 5,364
Canada	16,148	+ 6,580	3,550	+ 2,396	6,682	+ 3,699	3,138	+ 1,470
Other British Countries	97,054	+ 53,438	37,776	+ 26,474	16,895	+ 4,000	21,221	+ 6,192
Sweden	9,171	— 510	*	—	*	—	*	—
Denmark	20,743	— 3,141	*	—	*	—	*	—
Netherlands	18,608	+ 4,456	*	—	*	—	2,484	+ 1,292
Belgium	13,615	+ 6,303	*	—	*	—	*	—
France	20,819	+ 7,155	*	—	*	—	3,596	+ 823
Portugal	16,519	+ 13,136	*	—	*	—	*	—
Spain	2,115	— 3,593	*	—	*	—	*	—
Italy	2,352	+ 2,155	*	—	*	—	*	—
Greece	6,996	+ 3,189	*	—	*	—	*	—
Rumania	2,816	— 7,277	*	—	*	—	*	—
Egypt	6,860	+ 1,773	*	—	*	—	938	— 2,671
China	7,753	+ 398	*	—	*	—	5,186	+ 2,243
Brazil	9,854	— 11,677	*	—	*	—	*	—
Argentina	16,983	+ 8,248	*	—	*	—	1,449	+ 36
Other Foreign Countries	93,368	+ 13,206	7,434	— 959	28,106	+ 11,769	22,099	— 2,145
Total	£1,072,233	+ £280,233	£68,390	+ £8,579	£114,725	+ £42,699	£192,083	— £9,513

* Not classified separately.

Parliamentary News (BY OUR SPECIAL REPORTER)

The Reorganisation Proposals

In the House of Commons last week, Mr. Ridley asked the Minister of Transport whether the Government intended to introduce a Bill to implement the memorandum on electricity distribution. Dr. Burgin said that the Government had already announced its intention to introduce legislation dealing with the reorganisation of distribution of electricity supply.

Mr. Ridley asked if he was to understand the reply to mean that it was still the intention of the Government to embody the terms of the memorandum. Dr. Burgin replied that it was the intention of the Government to introduce legislation to deal with the reorganisation of the distribution of electricity supply. The memorandum to which the hon. member referred was a communication made to facilitate negotiations.

Sir W. Brass asked if it was to be understood that the reports in the newspapers that this had been dropped were entirely untrue. Dr. Burgin responded that the reports, the origin of which was unknown to him, were entirely without foundation and, so far as he knew, the exact contrary of what the Ministry proposed.

Mr. H. Morrison asked when this legislation was likely to be introduced and Dr. Burgin said that was a question for the Prime Minister, but he hoped that there would be no undue delay.

On June 16th, Mr. Parker asked the Minister if he would state what had been the general character of the replies so far received from the various organisations to which "Electricity Distribution—Outline of Proposals," had been issued.

Dr. Burgin said that the object of circulating the proposals was to facilitate discussion with representative associations. He did not think it would be helpful to disclose the nature or character of individual replies.

Electricity Sales and Prices

Sir Arnold Gridley asked the Minister of Transport if he would state the number of units sold by public electricity supply undertakings in the years 1930 and 1933, and for the last year for which corresponding figures were available; and how these were divided between municipalities and companies, respectively.

In reply Dr. Burgin circulated a statement with the official report showing the following sales in millions of kWh:—

Public authorities: 1930, 4,475.7; 1933, 7,030.1; 1936, 10,673.9. Companies: 1930, 3,454.1; 1933, 4,076.3; 1936, 6,129.6.

Sir Arnold Gridley also asked the Minister if he could state the average price per unit sold for power or industrial purposes, as distinct from domestic purposes, by municipalities and companies, respectively, for the last completed account year; and the number of such units sold by municipalities and companies, respectively.

Dr. Burgin said that in 1935-36 the units sold for power or industrial purposes (millions) were:—Public authorities, 4,900.5; companies, 3,349.5. The average revenue per unit was 0.669d. and 0.645d. respectively.

Direct Current Supplies

Sir A. Gridley asked the Minister of Transport if he would state the number of electricity distributing undertakings operated by municipalities and companies, respectively, which had not yet changed over their non-standard systems to the standard a.c. system; and the number of d.c. units sold by these undertakings, respectively, for the last completed account year.

Dr. Burgin said that in 1935-36 there were 217 public authority undertakings and 108 company undertakings which were giving d.c. supplies, and of these, 193 public authority undertakings and 76 company undertakings were also giving a.c. supplies, in the great majority of cases at the standard frequency of 50 cycles. Figures for the number of d.c. units sold were not readily available but there were about 1.2 million d.c. consumers out of a total of 7.7 million consumers.

The New Tax

On June 21st the House of Commons approved the new "National Defence Contribution" tax. Sir John Simon, the Chancellor of the Exchequer, explained that public utility undertakings which were now subject to statutory restrictions in regard to prices charged or dividends payable would be exempt. These undertakings would be of two kinds. First, they would be local authorities or public authorities of an analogous character—local authorities which supplied gas, water or electricity, or local authorities like the Port of London Authority or the Mersey Docks and Harbour Board. Secondly, the statutory undertakings might be companies which had been authorised by statute to render such services, but at the same time had been precluded from charging higher prices or distributing higher dividends than a stated maximum, and to that extent public utility undertakings would be exempt.

Mr. Dalton asked if it was to be understood that electricity supply companies as such would not be exempt—that it would depend on the constitution of the particular undertaking?

Sir J. Simon said that it would entirely depend on whether they fell within that definition. Those which were simply left at large would certainly not be exempt, but those which could show that there was a statutory restriction on them would be exempt.

In the Courts

Scophony v. International Television Corporation

In the Chancery Division last week Mr. Justice Farwell heard an action brought by Scophony, Ltd., for an injunction to restrain the defendants, Mr. E. H. Traub, the International Television Corporation, Ltd., and the I.M.K. Syndicate, Ltd., from inducing or attempting to induce certain employés and former employés of the plaintiffs to break their contracts of service with the plaintiffs and from disclosing in breach of the rights of the plaintiffs, secret information relating to their business which was that of designing and developing television apparatus and the making and exploitation of inventions directly or indirectly connected therewith.

Mr. K. E. Shelley, K.C., in opening the plaintiffs' case, said they were not claiming damages but only an injunction. The plaintiffs were the successors of a small company formed in 1930. In 1935 the company was promoted as a private company and a year later it was turned into a public company with a capital of £300,000. The defendant, Mr. Traub, who was interested in television, came into the story in about 1932 and afterwards secured employment with the defendant companies. He became research manager of the International Television Corporation, Ltd., and secretary of the I.M.K. Syndicate, Ltd.

The plaintiffs were pioneers of a particular form of television. The defendants in 1932 had a form of apparatus which was quite different from that on which the plaintiffs were then working. After Mr. Traub joined the defendant companies successive developments took place from 1933 down to the present time which, it was alleged, had been copies of those made by the plaintiffs a short time before. The defendants had sought to get in touch with plaintiffs' employés and to pump them for information which they must have known was secret. When, as it was alleged, the information was obtained by an offer of increased salary, the matter, as counsel submitted, went beyond the realm of legitimate competition.

The defendants denied that they had at any time endeavoured to induce any of the plaintiffs' employés to break their contracts of service or to disclose information of the plaintiffs' business.

On June 17th, at the conclusion of the evidence and the arguments of Mr. Shelley, for the plaintiffs, and Mr. Philip Vos, K.C., for the defendants, his Lordship, in giving judgement, held that upon the evidence, the defendant Mr. Traub had acted in the matter most improperly. Fortunately, his efforts were unavailing because of the loyalty of the three servants of the plaintiffs concerned. Sir Henry White Smith, a director of the defendant companies, had stated that he knew nothing whatever of what was complained of and that he would not have countenanced such a thing. It would have been better if the plaintiffs had brought the matter to the attention of Sir Henry White Smith who would have taken proper steps to see that it did not occur again. Unfortunately the plaintiffs did not give the defendant companies an opportunity of dealing with the matter before the writ was issued.

This, however, was a *quia timet* action and for the plaintiffs to succeed there must be evidence that what Mr. Traub had done would not only be repeated, but would lead to serious damage to the plaintiffs. There was no evidence that the efforts of Mr. Traub, which had been unsuccessful in the past, would be any more successful in the future. He therefore held that there was no cause of action and the plaintiffs could not succeed and there must be judgment for the defendants with costs.

Damages for an Accident

On June 17th, Mr. J. D. Cassels, K.C., stated to the Lord Chief Justice in the King's Bench Division that a settlement had been arrived at in the case of Aikman and another against the Strand Electric and Engineering Co., Ltd. He stated that the plaintiff, Mr. C. A. C. Aikman, a clerk, 17 years of age (suing through his father), whilst walking to his work on October 3rd last year, was struck on the head by a heavy piece of timber which fell from the defendants' premises. He sustained serious injuries and remained in hospital for eleven weeks. He had suffered from partial paralysis of his left side but it was thought that that would disappear in time although it might be that he would suffer from a permanent limp. In these circumstances the defendants had agreed to pay plaintiff £1,575 damages and the costs of the action. His Lordship assented to the settlement arrived at.

Universal Lamp Co. Scheme Approved

In the Chancery Division on Monday last Mr. Justice Crossman concluded the hearing of a petition by the Universal Lamp Co., Ltd., for sanction to a scheme of arrangement of its capital which involved the dismissal of a petition by Thorn

Electrical Industries, Ltd., for the compulsory liquidation of the company.

Mr. J. B. Lindon, for the Universal Lamp Co., said that under the scheme all preferential debts and unsecured creditors for £5 or under would be paid in full. The other unsecured creditors on January 12th last would be paid a composition of 5s. 6d. in the £ by instalments—2s. on the scheme being sanctioned and 1s. 2d. in three, six and nine months. The total amount due to unsecured creditors was £93,905, and the composition had been guaranteed by three guarantors accepted as satisfactory by the trustees appointed under the scheme. A large majority of the unsecured creditors were in favour of the scheme.

His Lordship sanctioned the scheme (to which there was no opposition) and dismissed the winding-up petition, but directed that the petitioning creditors' costs should be paid in full.

South African Electrical Imports

United Kingdom's best customer

THE following statement showing the values last year of the principal electrical imports into South Africa, the leading supplying countries, and the increases or decreases compared with 1935, are based on the recently issued annual statement of the foreign trade of the Union. In the machinery group there was a slight decline, which is not surprising in view of the large increase which took place in 1935, but in apparatus of all kinds except under the heading comprising telegraph and telephone material, substantial advances are recorded. It should be added, however, that in addition to the total shown below, telephone and telegraph materials to the value of £394,000 were imported from the United Kingdom in 1936 as Government Stores. The United Kingdom has a predominant position other than in the wireless trade, of which the United States has the bulk, but it is noteworthy that a large number of countries compete in the appliance market. The Union is the United Kingdom's most valuable customer for electrical goods, and already this year has bought twice as much machinery from this country as has its next most important customer.

Confidence in the future of the South African market, which was somewhat shaken early in April by fears of a slump in gold, has been to a large extent steadied not only by President Roosevelt's statement that no alteration in the dollar price was contemplated, but also by a reassuring statement on behalf of the British Government regarding the working of the Tripartite Monetary Agreement. Some nervousness, however, persists and it is permissible to point out that if the financial interests or authorities contemplated action such as would affect exchange rates they would scarcely endanger its effectiveness by disclosing their intention beforehand. In the meantime the import trade of the Union continues active generally. The respective Government Departments are in the market for electric locomotives and large quantities of telephone material, and local authorities are good buyers of lamps, cable and a variety of equipment.

	1936. £(000)	Inc. or dec. on 1935. £(000)
Cable and wire—		
Total	1,111	+ 206
From United Kingdom	980	+ 142
„ Belgium	29	+ 12
„ Germany	70	+ 35
„ Sweden	3	+ 2
„ United States	13	+ 6
Heating and cooking apparatus—		
Total	310	+ 56
From United Kingdom	93	+ 11
„ Canada	147	+ 20
„ Germany	18	+ 4
„ United States	42	+ 17
Meters—		
Total	51	+ 1
From United Kingdom	44	— 2
„ Germany	3	—
Electrical appliances, material and fittings, unspecified—		
Total	1,012	+ 103
From United Kingdom	718	+ 54
„ Canada	3	—
„ Austria	6	+ 3
„ Belgium	7	+ 2
„ Czechoslovakia	6	—
„ Denmark	15	+ 8
„ Germany	127	+ 46
„ Holland	8	+ 1
„ Sweden	20	— 2
„ United States	92	— 6
Electric hand lamps—		
Total	24	+ 3
From United Kingdom	3	+ 1
From Hong-Kong	6	+ 2
„ United States	9	—
Electric lamp bulbs—		
Total	196	+ 27
From United Kingdom	136	+ 36
„ Austria	8	— 3
„ Germany	10	+ 2
„ Holland	7	— 9
„ Hungary	8	— 1
„ Japan	7	+ 1
„ United States	16	+ 1
Self-contained lighting outfits—		
Total	40	+ 21
From United Kingdom	17	+ 10
„ United States	20	+ 9
Wireless appliances—		
Total	646	+ 114
From United Kingdom	92	+ 30
„ Holland	50	— 34
„ United States	489	+ 101
Other telegraph and telephone appliances—		
Total	53	— 70
From United Kingdom	44	— 68
„ Germany	3	—
„ Sweden	4	— 1
Porcelain insulators—		
Total	49	— 1
From United Kingdom	13	—
„ Canada	30	— 1
Batteries, primary—		
Total	129	+ 4
From United Kingdom	31	— 3
„ Germany	5	— 2
„ United States	90	+ 13
Batteries, secondary—		
Total	98	— 1
From United Kingdom	35	— 4
„ Germany	9	—
„ United States	52	+ 4
Dynamos and generators—		
Total	102	+ 55
From United Kingdom	68	+ 29
„ Germany	5	+ 3
„ Sweden	11	+ 10
„ United States	16	+ 14
Motors—		
Total	393	— 41
From United Kingdom	287	— 57
„ Germany	21	— 3
„ Sweden	30	+ 25
„ United States	37	— 8
Transformers—		
Total	295	+ 1
From United Kingdom	219	— 2
„ Germany	36	+ 10
„ United States	22	— 4
Electrical machinery, unspecified—		
Total	814	— 150
From United Kingdom	678	— 128
„ Germany	42	+ 7
„ Sweden	20	— 2
„ United States	68	— 14

Electric Arc Welding

A MEMORANDUM issued by the Factory Department, Home Office (Stationery Office, 3d.), sets out the precautions necessary to secure safety in arc welding. The dangers are electric shock, radiations from the arc, scattering of hot globules of metal and flying pieces of slag when being chipped away after welding.

To ensure against serious shock, the use of d.c. is to be preferred. Although the voltage across the arc may be only 20 to 40, it may on open circuit be from 50 to 100, which is considered safe in ordinary circumstances with d.c. When using a.c. the voltage should, if possible, not exceed $120/\sqrt{2}$. The transformer should be double wound and the pole of the welding circuit connected to the work should be earthed at the transformer by means of a water pipe or one or more pipes, 2 or 3 in. in diameter, buried vertically 6 ft. in damp ground and surrounded by 6 ins. of broken coke, rammed hard. Two or more solid rods driven into the ground not less than 4 ft. apart and coupled together is given as an alternative. There must be no switch or fuse in the earthed return lead to the transformer. Most fatal shocks occur when there is contact with the circuit by one hand.

The electrode holder should be provided with an insulated handle shielded from the projecting live portion and it should be solid without live set screws protected merely by being countersunk. Gloves are not to be relied upon as protection against shock. When the welder is not working on a dry wooden floor he should wear rubber boots.

If the enclosed switch for cutting off voltage from the whole of the welding lead is not readily accessible to the welder, a second foot-operated switch should be provided. The electrode should not have to be handled for renewal whilst the holder is alive. Any contacts or plug connections for carrying the current should be changeable without risk of touching live metal.

With d.c. at up to 100 V many of the above precautions may not be necessary although desirable. The supply voltage to a motor driving a portable welding generator should not exceed 650 V, an authorised person being in charge of the primary apparatus. A switch should be provided on the set for cutting off the primary voltage and the frame of the set should be earthed through a core in the supply cable connected to the system by a plug connection, preferably interlocked with a switch. For ship construction and similar work it is undesirable to carry the medium-voltage circuits on to the work. Where conditions are specially dangerous (*e.g.*, on stagings or in boilers) it is recommended that d.c. at not more than 60 V open circuit should always be employed.

The briefest exposure to radiations from an arc may be enough to affect the eyes painfully though not permanently. The appropriate grade of protective glass designated in B.S.S. 679-1936 should be used for hand screens or helmets. The wearing of spectacles fitted with Crooke's glass (which absorbs ultra-violet rays) is advocated as an additional precaution. Welding should be carried out in permanently screened-off areas, but even then crane drivers may be exposed to flashes. An asbestos apron, suspended from a roll of sacking tied at the waist and hanging at a distance of 2 in. from the body, is advocated as a protection from heat. Brief recommendations are also made regarding protection from hot metal, the chipping of slag, fumes and high temperature, while a reference is made to the a.c. welding plant and protective accessories on view at the Home Office Industrial Museum.

Business and Industrial Notes

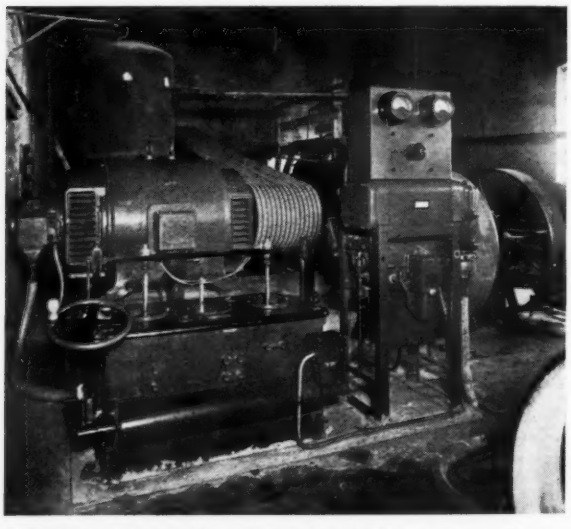
The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

A Northern Ireland J.I.C.

A Joint District Industrial Council representing the electricity supply undertakings and trade unions to which about 95 per cent. of the employés in the industry belong is to be set up in Northern Ireland. This decision was arrived at following a conference between the various parties held at the Ministry of Industry and Commerce in Belfast. Representatives of Belfast Corporation, Londonderry Corporation, and the Electricity Board attended the conference, and the trade unions represented were the National Union of General and Municipal Workers, the Electrical Trade Union, the Amalgamated Transport and General Workers' Union and the Amalgamated Engineering Union. Opening the conference, Major the Right Hon. D. G. Shillington said that during the past ten years 700 additional insured persons had found employment in the industry, and the total now stood at 4,600. The establishment of a district council in Northern Ireland would make available a type of machinery that had long since passed the experimental stage, and the industry would have the advantage of the experience gained in the working of these bodies in Great Britain. The industry in Northern Ireland would be linked up with that in Great Britain through the National Joint Industrial Council, the parent body. A difficulty which arose at the conference in connection with the formation of a similar board for the technical staff, due to certain local negotiations, will, it is hoped, soon be removed, and subject to this the conference approved the principle of the formation of a board.

Electric Drive in a Stone Quarry

The accompanying illustrations show a 400-h.p. Crompton autosynchronous motor which has recently been supplied to Derbyshire Stone, Ltd., by Crompton Parkinson, Ltd. The motor replaces a 2-cylinder gas engine which was installed twenty-one years ago, and drives the main line shaft. Power is derived from this source for four stone crushers, each capable of taking stones up to 25 in. by 14 in.; four sets of screens, two large and two small; one conveyor; one large hammer



A Crompton autosynchronous motor driving stone-crushing and other equipment

mill for secondary reduction; and one Ingersoll-Rand compressor having an output of 300 cu. ft. of air per minute. With the original gas engine, rated at 350 h.p. maximum, it was necessary to shut down a portion of the plant whenever it was required to operate the compressor. The 400-h.p. autosynchronous motor obviates the necessity for this. The output of the plant is 100 tons per hour of road metal and ballast.

Technical Tours

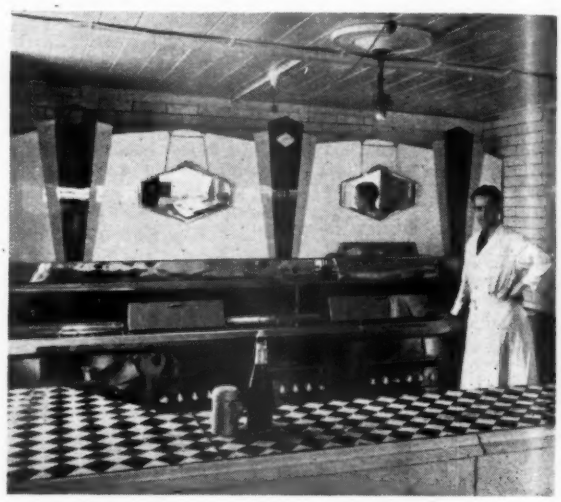
Centropa Tours, Ltd., Grand Buildings, Trafalgar Square, W.C.2, has sent us some details of its special train tours of Central Europe. The company informs us that the Hungarian State Railways Travel Bureau, which organises these tours, will arrange for engineer members of parties to be entertained by their Continental confrères and to have the opportunity of seeing everything of technical interest to them.

The Barnstaple Electrical Exhibition

The first electrical exhibition ever organised by the Barnstaple Corporation was opened on Monday, June 14th, by the Mayor, Capt. W. Slatter, who was accompanied by the Mayoress. The Mayor, who said he thought everyone needed such education as was provided by exhibitions of that kind, pointed out that by using electricity the people of Barnstaple were contributing to the prosperity of an undertaking in which they all shared.

Commercial Cooking at Great Yarmouth

During the past twelve months the Great Yarmouth Corporation Electricity Supply Department has connected seven



A large electric fish fryer at Great Yarmouth

electric fish and chip ranges. The accompanying illustration shows a five-pan range of 83 kW, which has recently been installed. This is of special interest as it is claimed that it is probably the largest installation yet made. It was supplied by Messrs. John Rouse, of Oldham.

The Great Hertfordshire Show

As usual, one of the most prominent features of the Great Hertfordshire Show, which was held on Wednesday and Thursday at Hatfield Park, was the exhibit of the North Metropolitan Electric Power Supply Co., which for the eleventh successive year provided a comprehensive display of electrical appliances for use in the farm and the home. As some 78 per cent. of the Northmet area of supply is rural in character the company has consistently adopted a policy of helping the farming community in rural matters. Supply at low charges is now available in nearly 250 villages and over 600 farms and agricultural premises are connected to the mains. Most of the apparatus shown could be seen in operation, a special sub-station with a 100-kVA transformer being provided to give the necessary power. The agricultural display was divided into sections, showing equipment suitable for use in poultry, dairy and general farming. The use of electricity in the nursery and market gardening was not overlooked. Appliances of special interest included the latest electric sterilisers, egg and tomato graders, incubators, automatic stokers and barn machinery, and poultry plucking, water pumping and milk cooling were demonstrated. The domestic section provided a full range of appliances for use by the farmer's wife, and included cookers, washing and ironing machines, water heaters and refrigerators, all of which cost little to run under the all-in two-part tariff with its "unit" charge of a halfpenny.

Electric Washers in South Africa

House-building activity and the general prosperity which have prevailed in South Africa have attracted the attention of exporters in the manufacturing countries to the possibility of increasing the sale of some of the newer lines of finished goods, particularly of a labour-saving and luxury nature. An outstanding example of this trend has been the marketing of electric domestic appliances by Canadian makers, and last month (May) Mr. J. C. Britton, the Canadian Assistant Trade Commissioner at Johannesburg, reported to his Government on the selling prospects for electric washing machines in the Union. While it is estimated that imports of these articles have increased from 150 in 1933 to over 1,500 yearly at the present time, the outlook for future increase is not regarded as very promising, because of the difficulty of persuading the average prospective purchaser to make the initial outlay, which in many cases exceeds the yearly wage paid to a washerwoman. There is readily available a plentiful supply of cheap

labour, and although the advantage and eventual saving in having laundry done on the premises is gradually being realised, Mr. Britton expresses the opinion that the sales volume of washing machines will never reach the figures recorded for electric refrigerators and electric cookers. There are many well-known brands on the market, mainly from the United States, Canada and the United Kingdom, and it is said that there are more of them than there are reliable distributors in a position actively to handle them.

Australian Electrical Notes

The long-continued refusal of the West Australian executive of the Australian Labour Party to register the local Electrical Trades Union branch has exasperated the E.T.U. of Australia, and that body, at a conference of all States recently held in Melbourne, decided to withdraw its affiliation from the A.L.P. throughout the Commonwealth unless the W.A. branch secures affiliation. If the Union withdraws its affiliation the A.L.P. will lose fees from 12,000 members.

A group at the Reyrolle sports, showing (left to right): Sir A. Wood, Messrs. F. G. H. Bedford (C. A. Parsons & Co., Ltd.), N. Merz, H. W. Clothier, G. Wansbrough, and J. Rosen (C. A. Parsons & Co., Ltd.)

A somewhat unusual claim was recently made against the Collie Municipal Council (W.A.) by a local resident, who contended that owing to the varying voltage of the electricity supplied to his house his wireless set was damaged to the extent of £7. He pointed out that although the supply was supposed to be 250 V it had increased at times to 280 V, with detrimental results to his set. The Council, however, decided that it was not legally liable, but is now getting into touch with electrical experts, who will shortly make a thorough examination of the town's system.

Stirling Highway, the main thoroughfare from Fremantle to Perth, is considered to be insufficiently lighted for modern traffic requirements, and the Public Works Department is being approached in order that the various local authorities connected with this lengthy thoroughfare can obtain guidance for a uniform scheme of lighting.

Prize-winning Window Display

In connection with the *Daily Mail* "Show and Sell" contest, Siemens Electric Lamps & Supplies, Ltd., offered three prizes for the best window displays of its "Full O'Power" batteries, and these have been awarded as follows:—First: W. E. Squire, Loughborough. Second: R. M. Dawes, Dorchester. Third: Express Radio Service, Southampton. In the accompanying illustration we show the window display which was awarded the first prize.

Refrigeration Luncheons

One hundred and fifty persons attended a refrigeration luncheon held at the Midland Hotel, Manchester, on Thursday last. The luncheon was served from eight different makes of refrigerators. Speeches were made by Mrs. Wm. Bragg (wife of Professor Bragg), Dr. Emrys Lloyd Jones, and Mr. J. K. Clayton, vice-president of the Manchester Publicity Association. Mr. Clayton said electrical refrigeration had already made considerable progress, so much so that he understood there were twelve million home refrigerators in use throughout the world. As usual, Great Britain had been a little slow at the start and possessed only 205,000. Mr. Clayton showed how inexpensive domestic refrigerators were to operate.

A campaign to make the general public "refrigerator-minded" was launched at Skegness on June 15th, when a refrigeration luncheon was held at the County Hotel under the auspices of the Mid-Lincolnshire Electric Supply Co., Ltd., and E.D.A. Dr. L. Giacomuzzi, M.I.E.E., chairman of the Mid-Lincs Co., presided, and short talks were given after the luncheon by Dr. B. Sweeten, Miss D. Foster-Jeffery (E.A.W.), Mr. J. Macdonald, Mr. F. Newey (engineer and manager of the Lincoln Corporation Electricity Department), Mr. F. Steadman (B.T.H. Co.), and Councillor J. Crawshaw (chairman of the Skegness U.D.C.).

At a luncheon given by the Hove Electricity Department on June 17th to inaugurate a special demonstration week of cold cookery, Dr. N. E. Chadwick, Medical Officer of Health, said he was wholeheartedly in favour of the installation of electric refrigerators in all houses.

Reyrolle's Sports

Messrs. A. Reyrolle & Co., Ltd., held their annual sports meeting at their Recreation Ground on June 12th, and 4,000 spectators witnessed a full afternoon's sport under excellent weather conditions. Thirty-two events were decided, and the total number of entries, over 1,500, provided by 500 individual competitors, was a record. The Bushing Co. (a subsidiary) won the maximum-points contest for the shield, with the Sales Department as runners-up. In addition to events confined to employés, there were four events open to all amateurs, including the three-mile Senior Championship of Northumberland and Durham. The directors entertained the employés and their families to tea, and at the close of the proceedings the prizes were presented to the successful competitors by Sir Arthur N. Lindsay Wood, Bt., chairman of the company. Other directors present were Messrs. N. Merz, H. W. Clothier, and G. Wansbrough.

The Refrigeration Campaign

A refrigeration poster-stamp for use on letters, account forms, &c., is now available from the British Electrical Development Association. The Association's July Sales and Publicity Programme also draws attention to the publicity material which it is issuing in connection with the refrigeration campaign. Examples of the cost of poster advertising are given, together with a list of 16-sheet and double-crown E.D.A. posters. A new booklet, "Everybody can have Electricity," designed for circulation to small- and medium-sized homes, is now available, and the "I'm Electric" mascot for cars and vans can now be had from stock.

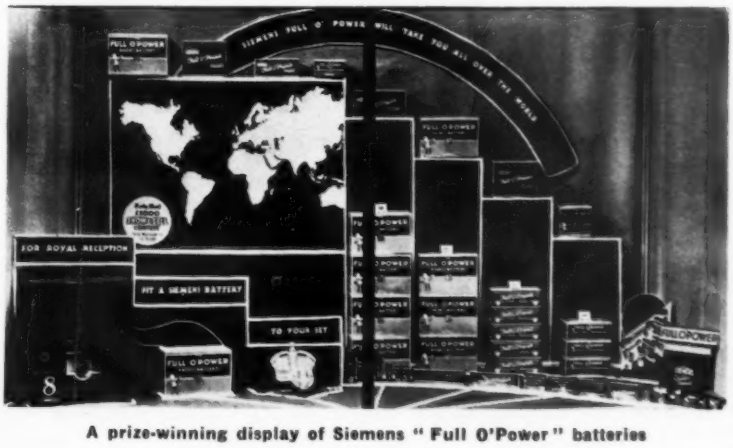
Annual Holidays

The works of Bruce Peebles & Co., Ltd., Edinburgh, will close on July 9th and re-open on July 19th.

Belling & Lee, Ltd., are closing their works from June 25th to July 5th for the works holiday. The offices will be open as usual.

The Northants Agricultural Show

Applications of electricity of interest to farmers and smallholders were demonstrated at the Northants Agricultural Society's annual show at Kettering on June 23rd and 24th, by Kettering Electricity Department, in conjunction with the Northampton Electric Light and Power Co., Ltd., and its associated companies, the Wellingborough Electric Supply Co., Ltd., and the Rushden and District Electric Supply Co., Ltd. Shown on the stand, which was considerably larger than in previous years, were a sprouted grain demonstration lorry showing grain after treatment; a poultry house lighted for increasing the hours of activity and feeding in winter; a steam raiser with an immersion heater capable of giving a pressure of 15 lb. per sq. in. within twelve minutes of switching on, suitable for connection to existing sterilising chests up to 75 cu. ft. capacity; complete sterilisers for farm utensils; cold rooms for



A prize-winning display of Siemens "Full O'Power" batteries

meat storage; incubators and hovers for chick rearing; a greenhouse fitted with tubular heaters; and cold frames equipped with soil-heating cables. Household refrigerators, water heaters and pumps were also shown, and electric cooking demonstrations were given in a special tent.

Orders Recently Booked

Philips Lamps, Ltd., has just received orders for fourteen installations of "Philora" electric-discharge lamp street lighting in various parts of the country. One of the biggest contracts just received is from Peterborough, where 270 "Philora" sodium lamps are to be installed in special Revo fittings, whilst the Bath Corporation is planning to install 300 150-W "Philora" sodium lamps in Wardle "Solux" units on the main roads around the city, following plans prepared by Mr. J. W. Spark, the city electrical engineer. Other authorities which have placed contracts for this form of lighting include: Bromley, Gillingham, Brentford and Chiswick, Mottram, Lanark C.C., Stalybridge and Hyde Electricity Board, Whitehall Securities, Bristol, Croydon, and the North-Eastern Electric Supply Co., Ltd.

Trade Announcements

On Tuesday the new premises of Henri Selmer & Co., Ltd., at Selmer House, 114-116, Charing Cross Road, London, W.C.2, were officially opened. One of the principal electrical activities of this company is the sole distribution in this country of the American "Pioneer" generators, which are produced with outputs of from 250 to 1,500 W for such purposes as caravans and yacht lighting; battery charging on aeroplanes, etc.; radio and sound equipment; and mobile neon signs. The company is now manufacturing entirely in this country "Truvoice" sound equipment, the English version of the American "Operadio" apparatus. An adaptation of this equipment is to be seen at the new offices in the form of a staff locating system, the telephone operator by means of a foot switch connecting up a microphone with twenty loud speakers all over the building. A research, testing and demonstration department has been arranged as well as a well-equipped service and assembly section and a storeroom. While dealing with the London orders itself, the company passes on all provincial inquiries to the local dealers whom it supplies direct.

J. H. Tucker & Co., Ltd., have transferred their London office and showrooms from D'Arblay Street to more commodious premises at 2, Newman Street, London, W.1 (telephone: Museum 8081-8082).

Fitz-Gibbon & Murray, Ltd., are removing to-day (Friday) to 35, Farringdon Road, E.C.1 (telephone: Holborn 4862).

Engineers' Wages

A claim for an increase of wages and other improvements in the conditions of employment was placed before the Engineering and Allied Employers' National Federation in London on June 18th by the unions concerned. The unions are making a general application for an increase of 2d. per hour, with equivalent advance to piece workers, and restoration of the pre-June, 1931, conditions. London engineers are claiming an advance of 2d. an hour above the national demand owing to the high cost of living. The unions also applied for consolidation of the war bonus into the base rate. It was afterwards announced that the conference had been adjourned to July 16th to enable the employers to consider the unions' statement.

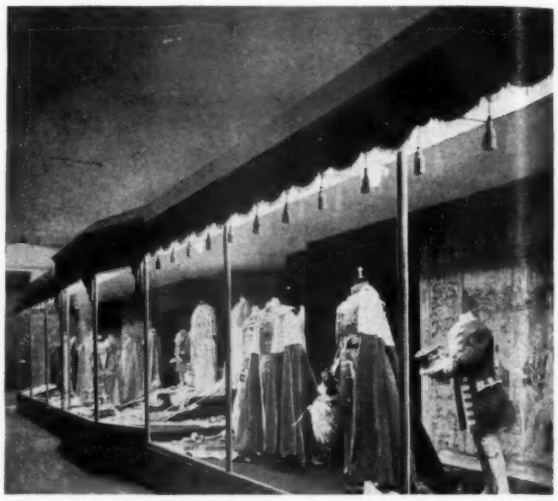
A Ferranti transformer being placed in position in the new Manchester offices of the "Daily Express." The transformer was transported and placed into position by Frank Morgan & Co.

Employment in May

Employment in the engineering industry during May showed little general change and remained good on the whole, being very good in electrical engineering. According to the *Ministry of Labour Gazette* the total out of work in the engineering industry was 54,716, a decrease of 1,396 as compared with the previous month, the percentage falling from 5.3 to 5.2 (7.9 per cent. in May, 1936). In the electrical engineering section the number of unemployed was 3,121, or 3.1 per cent (against 3.2 per cent. in April and 4.5 per cent. in May, 1936). The unemployed in the electrical wiring and contracting industry numbered 3,936, the percentage rising from 9.9 in April to 10.3 (12.5 per cent. in May, 1936). In the electric cable, apparatus, lamps, &c., group the unemployed decreased from 8,089 in April to 8,038, the percentage being 5.3 (against 7.3 in May, 1936).

Exhibition of Coronation Robes

The recent exhibition of the Coronation robes which was held at the Royal School of Needlework, South Kensington, called for special artificial lighting, as the main windows were



Holophane lighting at the Coronation robes exhibition

covered by draping. A lighting scheme was prepared by Holophane, Ltd., making use of the various types of prismatic reflectors to illuminate the gowns on show. The accompanying illustration shows the effective treatment of the main show case.

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the June 1st cost-of-living figure (52 per cent. above the 1914 level) will not involve any alteration in the wages of workers in the industry on the third pay day in July.

Copper Consumption in 1936

The annual meeting of the Copper Development Association was held on June 22nd, when Mr. D. O. Evans (chairman of the council), who presided, said that copper consumption in 1936 had again exceeded the figure of the previous year, establishing a record for Great Britain at approximately one quarter of a million long tons. One of the Association's principal functions, that of acting as consultants, had markedly increased. The management committee would be considering in the coming year the advisability of collecting certain statistical information on the copper industry. He was sure that sound statistical information could be helpful in preventing violent price fluctuations. Considerable information was already available on the production side, and the success of the scheme would depend largely on the help and interest which it was hoped would be forthcoming from all consumers of copper.

Socal Events

On June 19th the Simplex Electric Co., Ltd., held its annual outing. Both the Credenda Works and the Simplex Works were closed for the day. About 400 of the workpeople and staff at Credenda Works went by special train to Porthcawl. The function was organised by the Social Club secretary, Mr. C. Bradford, and lunch was arranged for at Coney Beach Café. The Simplex Works chose Blackpool for their outing, and a party of about 250 spent an enjoyable day at that popular resort.

The annual outing of the South Metropolitan Electric Light & Power Co., Ltd., was held on June 12th, when nearly 400 of the staff and employés travelled by special train to Brighton. Mr. C. J. Deave, local manager and secretary, presided at the luncheon, which was served in the Princes Hall at the Aquarium. Others present included Mr. F. J. Allbright, local manager of the South London Electric Supply Corporation, Mr. Holliday, engineer of the South Metropolitan E.L. & P. Co., Mr. Harper, mains superintendent, and other departmental chiefs. Brighton seems to have a particular attraction this year for the electricity supply industry. On this day it was the venue of the outings of five companies. The Bournemouth and Poole Electricity Supply Co., Ltd., and the South Metropolitan Electric Light & Power Co., Ltd., were lunching at the Aquarium. The West Kent Electric Co., Ltd., was at the Metropole, and the Sevenoaks and District Electricity Co., Ltd., and the North Metropolitan Electric Power Supply Co. were also there.

The Dagenham Cables Sports Club fête and gala was held on June 19th at the club ground. Despite unfavourable weather in the early afternoon, about 3,500 people were present. From the opening ceremony at 2.30 p.m. by Mr. J. Snow Huddleston, M.I.E.E., until dusk there was a continuous programme, including eighty boys from the training ship *Exmouth* with band and hornpipe party, Punch and Judy shows, ambulance display, horticultural show and numerous side shows. There were 500 entries for the various events from the members of the club, who are employés of the Union Cable Co., Ltd., and Southern United Telephone Cables, Ltd. Among those present were Mr. and Mrs. J. Snow Huddleston, Mr. and Mrs. C. Pipkin and Mr. J. H. Roberts.

A Library of Business Information

The Central Public Library, Bristol, has issued a guide to the library of commerce with the object of drawing attention to the resources of the library which is embodied in the Central Public Library. It is a library of information about every phase of business and commercial activity, and contains a comprehensive collection of modern books, pamphlets, maps and periodicals. The guide includes a list of subjects covered by the books and pamphlets, among them being a wide selection of works on electrical subjects.

August Holiday Pay

Erskine, Heap & Co., Ltd., have decided to pay the wages of their employés for their annual August Holiday week.

Prices of Materials

Henry Gardner & Co., Ltd., report, June 23rd: No change in the price of copper bars (best selected), sheet and rod. English pig lead, £23 10s., 10s. increase. Spelter, £20 8s. 9d., £1 8s. 9d. increase. English block tin, £246, £3 increase.

Edward Till & Co. report, June 23rd: No change in the price of India rubber, Para fine.

New Catalogues and Lists

Elliott Brothers (London), Ltd., Century Works, Lewisham, London, S.E.13.—A leaflet (No. F.19) dealing with a.c. portable instruments.

Brook Motors, Ltd., Empress Works, Huddersfield.—An abridged price list of a.c. motors and control gear.

Bull Motors, Grey Friars Works, Ipswich.—A leaflet dealing with "super silent" motors.

Alkaline Miners Lamps, Ltd., Victoria Works, Marshgate, Stratford, London, E.15.—A booklet dealing with switchgear operation and air-insulated batteries.

C.A.V. Bosch, Ltd., Acton, London, W.3.—Working particulars, with running instructions, of commercial vehicle lamps and compensated voltage control dynamos.

Measurement, Ltd., Terminal House, Lower Belgrave Street, London, S.W.1.—Two illustrated art catalogues illustrating and describing a.c. and d.c. house service meters.

British Insulated Cables, Ltd., Prescot.—A pamphlet relating to cadmium copper for overhead power transmission lines.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, London, E.C.1.—New catalogues dealing with insulated cut-outs and "Sharborn" relays.

Santon, Ltd., Somerton Works, Newport.—New leaflets dealing with thermal storage electric water heaters, immersion heaters and quick-service water heaters.

George Ellison, Ltd., Perry Barr, Birmingham, 20.—List No. 166 describing distribution draw-out switchgear.

Northern Steel and Hardware Co., Ltd., 7, Gartside Street, Manchester, 3.—A 116-page illustrated catalogue of electrical installation accessories.

Bankruptcy Proceedings

A. E. Baker, 42, Chapel Road, Bexley Heath, electrical engineer.—The public examination of this debtor was held at the Court House, Rochester, recently. It was reported that there were gross liabilities of £1,590 and assets of £192. Debtor stated that the contributory causes of his present position were underestimating, insufficient margin of profit and lack of capital.

S. W. Bridges (British and American Radio Service Co.), radio and electrical dealer, 37, Melgund Road, Highbury, N.5.—Receiving order made June 14th on debtor's own petition. First meeting June 28th and public examination July 21st, both at Bankruptcy Buildings, Carey Street, W.C.

A. H. Estall, electrical contractor, 20, Thackeray Street, Kensington, London, W.8.—The public examination of this debtor was held on June 16th before Mr. Registrar Kean at Carey Street, W.C.2. Replying to Mr. H. H. Gaine, Senior Assistant Official Receiver, the debtor stated that his liabilities amounted to £1,033 and his assets were estimated to produce £429. He attributed his insolvency to a loss of about £485 incurred in connection with the installation of electrical apparatus in a Council school, bad debts and ill-health. The examination was closed.

J. English, 287, Alcester Road South, King's Heath, Birmingham, radio and electrical engineer and contractor.—The public examination herein was held at the Court House, Birmingham, on June 16th. The statement of affairs submitted showed a deficiency of £453. Debtor stated that he sold about forty sets a year on hire-purchase. He attributed his failure to lack of capital, drawing in excess of profits and depreciation in the value of fixtures and fittings. The examination was provisionally closed.

A. J. Payne, radio dealer, 327, Kilburn Lane, N.W., lately 31, Hillside, Stonebridge Park, N.W.10, and Station Road, Harlesden.—The public examination of this debtor was held on June 15th at Carey Street, W.C.2, before Mr. Registrar Barton. Replying to the Official Receiver, Mr. Bruce Parke, debtor stated that his liabilities amounted to £844 and he had no assets. He attributed his present position to liability under a guarantee and judgments for goods supplied to his wife in her business. The examination was closed.

J. Conlon, 1b, Buckingham Street, Hull, electrical engineer.—This debtor's public examination was closed on June 14th at the Guildhall, Hull, when it was reported that the liabilities amounted to £123 and the assets to £35.

C. Thornton, wireless dealer, Radio Store, Main Street, Ffynnongroew, Flint.—Last day for receiving proofs for dividend June 30th. Trustee, Mr. I. D. Hooson, St. Peter's Churchyard, The Cross, Chester, Official Receiver.

F. V. Howitt (Falksley Co.), electrical engineer, Riste's Place, Barker Gate, Nottingham.—Last day for receiving proofs for dividend June 30th. Trustee, Mr. A. J. Rogers, 22, Regent Street, Park Row, Nottingham, Official Receiver.

C. J. Tann, radio engineer, "Brianscot," Station Road, Wootton, I of W.—Receiving order made June 10th on debtor's own petition.

F. R. Keenan, electrical engineer, 104, Cheltenham Road, Evesham.—Receiving order made June 15th on debtor's own petition.

A. G. Applegate, radio dealer, 47, Trinity Street, Frome.—Trustee, Mr. H. Wheeler, 26, Baldwin Street, Bristol, released June 8th.

A. W. Hovell, wireless dealer, 22, High Street, Beckenham, Kent.—Last day for receiving proofs for dividend July 2nd. Trustee, Mr. L. C. Webber, 64, Gresham Street, E.C.

A. E. Cowee, radio and electrical engineer, 113, Mount Pleasant Road, Tottenham, N.17.—Last day for receiving proofs for dividend July 2nd. Trustee, Mr. J. L. Poland, 29, Russell Square, W.C.1.

W. Sims, electrical engineer, 16, St. James Terrace, Buxton.—First and final dividend of 7¾d. in the £. payable June 29th at the Official Receiver's office, Byrom Street, Manchester.

R. T. Collins, wireless dealer, 41, Market Street, Penryn.—First and final dividend of 4s. 1d. in the £, payable June 28th at 12, Princes Street, Truro.

Company Liquidations

Dorman & Smith, Ltd.—Meeting July 19th at 64, Cross Street, Manchester, to receive an account of the winding-up by the liquidator, Mr. H. Terras.

John H. Hackman, Ltd.—Winding up voluntarily. Liquidator, Mr. R. W. Morley, 10, Gladstone Terrace, Brighton.

Walls Radio, Ltd.—Winding up voluntarily. Liquidator, Mr. A. W. Miles, 1, Westover Mansions, 13, Gervis Place, Bournemouth. A statutory declaration of solvency has been filed.

Mack's Auto-Electric Co., Ltd.—Meeting July 19th at 3, Clwyd Street, Rhyl, to receive an account of the winding up by the liquidator, Mr. H. Smith.

Parkers Radio Co., Ltd.—Meeting July 19th at National Provincial Bank Chambers, Hertford Street, Coventry, to receive an account of the winding-up by the liquidator, Mr. J. T. Chaplin.

The Science Museum Report

THE report of the Advisory Council of the Science Museum for the year 1936 (H.M. Stationery Office, 1s. net) reveals that overcrowding has necessitated external storage of exhibits. Even when the centre block is reconstructed existing collections will completely fill the Museum and the development of many sections will continue to be handicapped. The building of a third block and expansion of the library are advocated.

During 1936 visitors totalled 1,281,338 and organised parties (1,752, totalling 47,352 individuals) have trebled in five years. Two guide-lecturers delivered 627 public lectures (34 on special exhibitions) to an attendance of 24,962, in addition to 285 special lectures to organised parties.

There have been a number of special exhibitions; for instance, that on the attainment and uses of very low temperatures was a sequel to the refrigeration exhibition in 1934, and it attracted over 200,000 visitors in four months. Another special exhibition devoted to electric illumination (which ended last month) is now being formed into a new section for addition to the permanent collections, while the latest display is the Television Exhibition. There is a brisk demand for the guide-handbooks specially prepared for these displays.

During 1936 loans and gifts totalled 1,118. The industrial engineering division is seriously handicapped by lack of space, and the need for additional staff seems to be urgent. Additions have been made to the sections devoted to welding, electric power, telephony, radio, television, tramways and traction-motor control, electrical and magnetic instruments, and electro-acoustical devices.

The Science Library receives more than 9,000 current periodicals and a selection of other works, representing about two-thirds of the world's annual output. It receives about 8,500 volumes a year by presentation, in addition to purchasing 600 books and 900 periodicals per year. In the reading room there are 40,000 volumes, and there are 200,000 more in the book stores.

The subject-matter index is increasing at the rate of 140,000 references annually, the number of index cards now totalling 2.5 millions. In 1936 issues to readers in the reading room totalled 20,700 and books on loan numbered 21,000. This library is recognised as the international information centre for science and technology, and it has access to a complete classified index to the patent specifications of all the major countries.

Electricity Supply

Lighting, Domestic, Power

Aberystwyth.—POWER TARIFF.—A new scale of charges for power, ranging from 1¼d. to 1d. per kWh according to consumption, has been adopted by the Council.

Australia.—LARGE HYDRO-ELECTRIC SCHEME.—The construction of a 200,000-kW hydro-electric station on the Kiewa River in order to meet the estimated increase in consumption during the next fourteen years is recommended by the Victoria Electricity Commission.

Aylesbury.—SWITCHGEAR EXTENSION.—Sanction has been obtained by the Borough Council to borrow £7,750 for a 14-panel, 11-kV metal-clad switchgear installation to control the whole of the extra-high-voltage supply from the electricity works.

Bolton.—CHEAPER ELECTRICITY.—Reductions in charges amounting to £24,000 in a year are to be made by the Electricity Committee.

Bournemouth.—BETTER LIGHTING.—Sanction is being sought by the Lighting Committee to a loan of £12,009 for the first part of the ten-year scheme for improving the lighting throughout the borough.

Brighton.—SUB-STATION.—A new sub-station is to be provided by the Electricity Committee in order to furnish an adequate supply of electricity for the further building development on the East Brighton estate.

Darlington.—CABLES.—Application is to be made by the Town Council for sanction to borrow £3,020 for laying feeder cables.

Dover.—INCREASED SALES.—Although a two-part tariff will only be available as from next October, the report of the Electricity Department for the past year indicates that none the less there has been considerable expansion in domestic power and heating supplies, which rose by 71 per cent. to 1.3 million kWh. In private lighting the increase was 14 per cent. to 2.6 million kWh. Owing to the tramways ceasing to operate at the end of 1936 there was a reduction of 26 per cent. under this heading, so that the total increase in sales of 13 per cent. to 6.3 million kWh does not fully reflect the progress made. Revenue amounted to £67,424 and working expenses to £47,174. After deducting the various charges there was a net profit of £1,938, which, with a credit balance from the previous year, made £2,598, but against this it has been necessary to set part of the cost of the change-over, leaving a net deficit of £730.

Edale (Derbyshire).—CANVASS.—The Yorkshire Electric Power Co. is canvassing the area to ascertain whether the number of consumers would justify an extension of mains. At a recent meeting at Edale the secretary of the Derbyshire Rural Community Council said it was the Council's desire that electricity should be available to all the villages in Derbyshire, and in particular to Edale. The Council realised that overhead lines were the only means whereby the Edale Valley could secure a supply, and asked to be allowed to collaborate with the power company in the planning of the lines in order to preserve the amenities of the district.

Lucknow Station (East Indian Railway) floodlighted for the Coronation

Egypt.—HYDRO-ELECTRIC WORKS.—A water power installation is to be established at the Fazoum oasis, about sixty-two miles from Cairo. The capacity is to be 3,400 kW, and three pumping works are to be operated at a distance of about twelve miles by means of overhead conductors. The order for the electrical plant has been given to Siemens-Schuckertwerke, while the mechanical section will be provided by the Escher-Wyss company, Switzerland.

Gateshead.—SUB-STATION.—The North-Eastern Electric Supply Co., Ltd., proposes to erect a sub-station on the Hill Crest estate.

CANVASS.—A canvass is to be taken by the Town Council among the 397 tenants of the Carr Hill estate to ascertain whether they are in favour of having electricity or gas in their houses. The North-Eastern Electric Supply Co., Ltd., and the Newcastle and Gateshead Gas Co. have submitted estimates for installations.

Godstone.—UNDERGROUND MAINS.—The Sevenoaks and District Electricity Co., Ltd., has agreed to the suggestion of the Rural District Council that the supply lines at Finches Cross, Oxted, should be laid underground.

Hartley Wintney.—OVERHEAD LINES.—No objection has been raised by the Rural District Council to a proposal of the Mid-Southern Utility Co. to place a high-voltage overhead line upon private land near Inholmes.

SUB-STATIONS.—The company is to erect sub-stations at Sutton Warblington, South Warnborough, and on a site near Yateley Hall.

High Wycombe.—STREET LIGHTING.—The Town Council, having accepted a tender for the supply of thirty-four steel lamp columns, has authorised the Lighting Committee to arrange for the Wycombe (Borough) Electric Light and Power Co., Ltd., to lay a new cable and install the lamps at a total estimated cost of £1,243.

Honiton.—INQUIRY.—A Ministry of Transport inspector, Mr. Martyn Hooke, held an inquiry at Honiton on June 16th into an application of the East Devon Electricity Co., Ltd., for permission to erect an overhead line through part of Honiton, to which objection was made by the Town Council. Explaining the application, Mr. H. F. G. Woods, manager of the company, stated that at present the Honiton supply was taken from Heathfield Farm to two sub-stations in High Street. In order to safeguard the supply, and to provide means for increasing it, the company desired to erect an 11-kV three-phase line from an existing sub-station near Streamers Meadows. For the Town Council, Mr. E. H. Byrde, the town clerk, said that the Council felt it its duty to oppose the making hideous of a lovely spot with black poles and cables. He also contended that on the present basis of electricity charges the company would not get the farmers and the poorer people to take electricity. Replying to the town clerk's points, Mr. Woods said that if the Council were to succeed in its opposition solely on the basis of amenities the result would be disastrous to the company's development, for other local authorities would follow suit and the company would find it impossible to put up any overhead lines. Since the company took over the undertaking the consumption had gone up about six times and the average price had fallen in the borough of Honiton from just under 10d. to 3.1d. per kWh. Many thousands of small-cottage dwellers in the county took a lighting supply at a shilling a week, including the wiring rental, and as a rule such customers soon went over to the two-part tariff and used electricity for cooking and other purposes. In the area covered by the company 80 per cent. of the consumers who cooked by electricity dwelt in cottages, and the majority of those who did so in Honiton lived in Council houses. He mentioned that the company had only just reached the dividend-paying stage, and that it was hoped before long to reduce the price of electricity still further. Reference was also made by him to a proposal to give supplies to a big rural area in East Devon by taking a line through Wilmington and Colyton to the Sid Valley at a cost of between £2,100 and £2,200, although for many years to come the company did not see how it could get a total revenue of more than 12 per cent. of the capital charge. The inspector intimated that he would pay visits to the places stated to be affected by the proposed overhead line before making his report.

Hull.—PRICE OF COAL.—Mr. J. N. Waite, electrical engineer and manager, informed the Electricity Committee recently, in answer to a question, that the extra cost of coal to the Department for the last financial year was £20,578. At the moment they were paying 18s. 6d. per ton as against an average of 13s. 4¼d. last year and 11s. 1d. in the preceding year. It meant that reductions which might have been made in their tariffs could not now be made.

Littlehampton.—REDUCED DOMESTIC RATE.—On July 1st the Sussex Electricity Supply Co. will reduce the domestic two part tariff running charge from 0.7d. to 0.5d. per kWh.

London.—BATTERSEA.—A recommendation has been made by the Works Committee for public lighting in St. James Road. It is suggested that mercury electric-discharge lamps with the "Lewisham" type lantern should be used.

HACKNEY.—Sanction is being sought by the Electricity Committee to borrow £5,000 for vertical distributors.

ISLINGTON.—A recommendation has been passed by the Electricity Committee for the purchase of equipment at a cost of £1,000 for the development of the rental wiring installation department, which was established experimentally six months ago.

The Electricity Committee is to improve street lighting at a cost of £3,490.

STOKE NEWINGTON.—The Highways Committee recommends

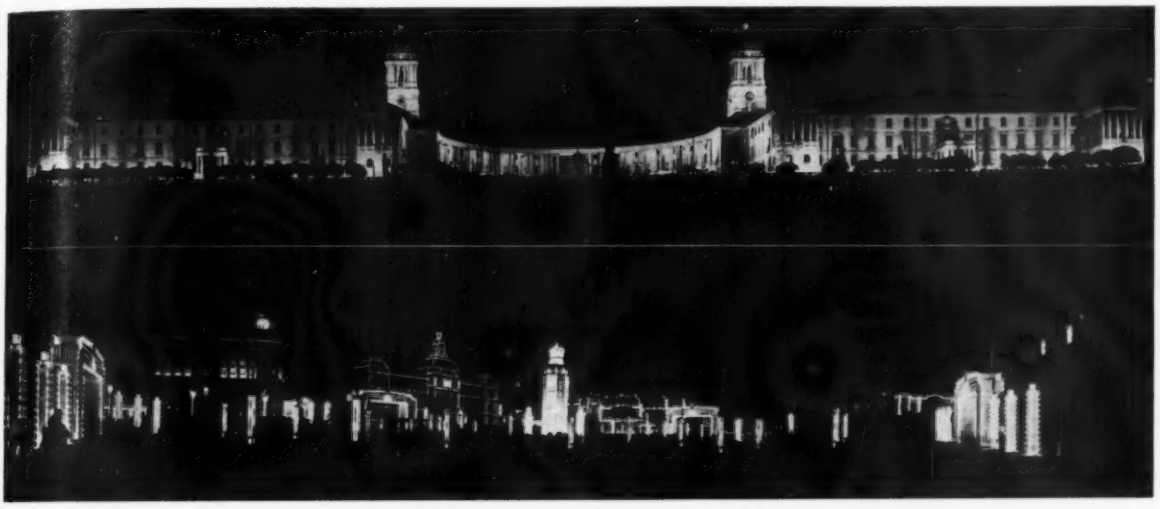
the installation of mercury electric-discharge lamps in Manor Road, Lordship Park and Brownswood Road. The estimated cost is £1,700, the annual charge in respect of electricity, maintenance, loan charges, &c., being £840 as compared with £271 in the case of the existing lamps. An a.c. supply being required, the Electricity Committee proposes to proceed with the erection of a sub-station on land near Manor Road, at a cost of £4,960.

Middlesbrough.—ELECTRICITY FOR HOUSING ESTATE.—Consideration has been given by the Town Council to the question of supplying electricity to 350 houses to be built at Middlesbrough for the Sutton Dwellings Trust. It has been decided to introduce a fixed charge of 2s. 7d. weekly for each tenant, electricity to be used for almost all purposes.

TRANSFORMERS.—The Town Council is to purchase two 600-kVA transformers for the Electricity Department.

Nelson.—OVERHEAD LINE.—A duplicate overhead supply line and equipment are to be provided between Barnoldswick and Earby, subject to the two authorities accepting responsibility for the increased annual cost.

Northern Ireland.—BELFAST.—An increase of 17.5 million kWh in the sales of electricity and a working profit of £324,709 during the year ended March 31st last have been reported by the Electricity Committee. The quantity of electricity sold during the year was 162.2 million kWh, domestic supplies having risen by 4.4 million kWh. Mr. F. H. Whysall, city electrical engineer, in his annual report, states that the number of consumers connected to the supply network at the end of March last was 58,697, an increase of 12,634. During the year eighty-four miles of cables were laid, ten miles of overhead lines were constructed and seventy-six miles of service mains were laid to consumers' premises. The demand for large power supplies continued to increase, the engineering, textile and milling industries appreciating the advantages of driving their machinery from the public supply. Development in all residential areas continued rapidly, as did the work of changing consumers' supplies from d.c. to a.c. Coal consumed was 135,885 tons, the average cost being 19s. 7.2d. per ton, as against 17s. 4.8d. per ton in the previous year.



Above: The permanent floodlighting installation at Union Buildings, Pretoria, for which G.E.C. equipment is used. Below: A panoramic view of the Coronation illuminations at Church Square, Pretoria; on the left is the Standard Bank of South Africa with "Osira" colour-lighting

Paignton.—OVERHEAD LINES.—Notification has been received by the Urban District Council that the Torquay electricity undertaking is to construct a 33-kV system in the district.

Pencoed (Glam).—COLLIERY ELECTRIFICATION.—During the next twelve months the Wern Tarw Colliery is to be completely electrified. The South Wales Coalite Co., Ltd., took over the colliery a few weeks ago, since when the South Wales Electric Power Co. has erected three-quarters of a mile of 33-kV line to the pithead. Ultimately, both the colliery, and the new coalite works which are to be erected nearby, will be served for power purposes by an outdoor sub-station with a total capacity of 4,000 kW. The main contracts for the new electrical colliery plant have been secured by the Metropolitan Vickers Electrical Co., Ltd.

Peru.—HYDRO-ELECTRIC POWER STATION.—Work is rapidly progressing on the construction of a new hydro-electric power station at Barbablanca, Peru, for the Sociedad Empresas

Distribution Proposals Opposed

REPRESENTATIVES of the local authorities of North Wales met at Rhyl on Wednesday, June 16th, to consider proposals relating to the distribution of electricity contained in the memorandum recently issued by the Ministry of Transport. Alderman Barlow (Oswestry) proposed a resolution, which was carried, expressing opposition to any scheme for the reorganisation of distribution which did not provide for the continuance of direct public control. Alderman E. Hughes (Wrexham) said that the real trouble in North Wales was that under the Order of 1923 they delegated the powers of the Joint Electricity Authority to a company. If the J.E.A. had retained the powers of generation and distribution of electricity in the North Wales and South Cheshire area he felt certain that their position in North Wales would have been very different to what it was now. The Power Company had rendered very good service, but instead of being the masters they should have made them the servants. It was decided to set up a special committee consisting of the electrical engineers and one representative of each of the public authorities concerned to formulate a distribution scheme for submission to a further meeting. Another resolution to be forwarded to the Government points out that no scheme can be satisfactory which does not provide for some definite assistance to be given to aid the electrification of rural areas. Various speakers called particular attention to a proposal by the Kendal Council in favour of a levy on the whole industry for this purpose.

That there was no reason why any attempt should be made to eliminate electricity undertakings, such as that at Holmfirth, which were offering very low tariffs and were in a sound financial position was stated at a recent meeting of the Urban District Council, when it was unanimously decided to protest against the proposals of the Ministry of Transport.

The committee appointed by the conference of north-eastern local authorities at Sunderland on June 8th held its first meeting recently. There were present fifty-six representatives of local authorities. A sub-committee was appointed, consisting of delegates from eleven north-eastern towns, to prepare a full report and, if necessary, to consult experts. The committee agreed to ask all the local authorities in the area to prepare what in their opinion would be the most suitable scheme for their own area for the consideration of the full committee.

The West Hartlepool Town Council has decided to protest strongly against the proposal to set up a distributing authority for the area from Amble to Whitby, which the Council contends would be out of the control of the local authorities.

Clitheroe Town Council has decided to resist the McGowan recommendations, especially regarding the grouping of authorities. Councillor Dewhurst, chairman of the Electricity Committee, told the Town Council on June 15th that a deputation from Clitheroe which was received by the Electricity Commissioners found that they had already received objections from other undertakings in the group, demonstrating the impracticable character of the proposed arrangement.

Dr. H. S. Houldsworth, K.C., chairman of the Heckmondwike Electricity Committee, moved a number of resolutions, which were adopted unanimously, at a recent meeting of the Urban District Council. In these protest was made against the proposed compulsory transfer of small electricity undertakings to larger ones, irrespective of the efficiency of the small undertakings, and against the compulsory transfer of publicly owned undertakings to private ownership. Further, the opinion was expressed that the Heckmondwike undertaking was capable of conforming, without rate contribution, to any reasonable standard as to tariffs and standardisation of system, and that the consumers would not benefit by any transfer. In the light of these views the Council pledged itself to oppose the compulsory transfer of its electricity undertaking by all legitimate means.

The Macclesfield Electricity Committee protests against any interference with the Council's right to purchase the undertaking of the Electricity Co. of Macclesfield, Ltd. It considers it unfair that the Council should not be consulted through not being one of the electricity undertakers in the group.

A conference of all the local authority undertakings in Kent was arranged to be held at Maidstone yesterday (Thursday).

Electricas Associadas, of Lima. The initial installation will comprise two Brown-Boveri horizontal-shaft generators coupled to 17,150-h.p. Pelton-wheel turbines.

Poland.—NEW GENERATORS.—Four new 15,600-kVA three-phase alternators for the Roznow power station are at present in course of construction at the works of the Brown-Boveri Co. at Mannheim, Germany.

Portland.—SUPPLY EXTENSIONS.—The Urban District Council is to ascertain the contribution likely to be obtained from the Admiralty for the provision of a supply to Portland Bill, which is estimated to cost about £5,000.

Richmond (Yorkshire).—CHEAPER ELECTRICITY.—The following reductions in charges have been adopted by the Town Council: Flat rate, reduced from 4½d. to 4d.; two-part tariff domestic running charge reduced from 1d. to ¾d. per kWh; minimum charge for ordinary supply reduced from 27s. to 24s.

St. Neots.—STREET LIGHTING.—The method to be adopted for future street lighting is under discussion by St. Neots Urban District Council, as the present agreement with the Bedfordshire, Cambridgeshire, and Huntingdonshire Electricity Co. expires shortly.

Siam.—PROGRESS DURING THE YEAR.—The report of the Siam Electric Corporation, Ltd., for last year shows that the number of consumers increased from 23,994 to 27,873 and the load on the power station from 17,716 to 18,422 kW. During the year the Paknam electric railway was taken over by the Government although the necessary power continues to be supplied by the Siam Corporation.

Southend-on-Sea.—NEW EQUIPMENT.—The Town Council has authorised the electrical engineer to proceed with the equipment of transformer stations at an estimated cost of £2,430.

Stoke-on-Trent.—MAINS.—The Electricity Committee is to extend mains in the Ashwood, Longton, area at a cost of £850.

SWITCHGEAR.—Extra-high-voltage switchgear is to be provided by the Electricity Committee in the East Fenton, Sutherland Road and Granville Place sub-stations, at a cost of £850, for the control of the feeder between these sub-stations.

Tealby.—SUPPLY PROPOSED.—The North Lincolnshire and Howdenshire Electricity Co. is to proceed immediately with arrangements for an electricity supply to Tealby.

Wimbledon.—ELECTRICITY FOR A LAUNDRY.—Terms for a supply to the laundry of Loud & Western, Ltd., in York Road, Wimbledon, have been arranged by the Electricity Committee.

Wolverhampton.—SUB-STATIONS.—The Electricity Committee is to provide sub-stations at Heath Town at a cost of £740 and at Aldersley (£960).

Traction

Austria.—NEW ELECTRIC RAIL COACHES.—The State Railway authorities are at present trying out two new types of electric rail coach. One vehicle is a high-speed, eight-wheel passenger coach, while the other is a light luggage van. Two examples of each type are under test and in a recent issue of *Elektrotechnik und Maschinenbau* Herr Walther Orel gives a description of the electrical and mechanical features.

The cable, with floats attached, being fed into the water of Loch Awe

France.—PARIS UNDERGROUND RAILWAY DEVELOPMENTS.—The present year will see many additions to the system of the electric underground railways in Paris, which at the end of 1936 aggregated about 90 miles, several extensions to existing lines being in course of construction. As regards the rolling stock, steel bodies are steadily being adopted in place of those of wood construction, sixty motor coaches being in course of conversion. Altogether, the Metropolitan Co. owns 2,780 passenger coaches, of which 1,397 are motor-equipped, and seven electric goods locomotives. There are now twenty-five transforming stations in use in connection with the different lines, their total capacity being 161,580 kW. Conversion to d.c. is 59½ per cent. by rotary convertors and 40½ per cent. by mercury rectifiers. Although there are still thirty-eight lifts in use for the conveyance of passengers to and from the streets to the platforms, the number of escalators has been increased to sixty-seven.

ELECTRIFICATION OF THE PARIS-LE MANS RAILWAY.—Work has now been completed on the electrification of the Paris-Le Mans section (132½ miles) of the Paris-Brest railway. The line is being supplied at 1,500 V, d.c., by thirteen automatic converting stations equipped with mercury rectifiers. The main supply is furnished at 90,000 kV by aluminium-steel alloy cables erected alongside the railway track for the major part of its length. The masts carry six conductors forming two three-phase circuits, each conductor comprising thirty-seven wires with a total cross-section of 189 sq. mm. According to the *Revue de l'Aluminium* some tests have been carried out with the object of replacing the somewhat costly cadmium-bronze supporting wire for the overhead supply to the trains with one of aluminium-steel alloy with, so far, satisfactory results.

Swansea.—CESSATION OF TRAMWAYS.—The tramway system is to be completely discontinued on June 29th. Bus services already operate on several routes, and the tram rails are being taken up. Two sections remain, however, and these are to give way to bus services at the end of the month.

Communications

China.—RADIO TELEPHONIC COMMUNICATION WITH THE UNITED STATES.—A radio telephonic communication service between China and the United States was officially inaugurated recently. Exchange of greetings between the two countries was successfully made by officials and was followed by commercial toll calls which are reported to be already utilising the full facilities of the service.

France.—RADIO FOR AIRCRAFT.—A directional radio station is to be placed in service shortly at Macon to assist aircraft. This action follows the loss of the Imperial Airways flying boat *Capricornus* there in March last.

Great Britain.—TENNIS TELEVISED.—Play on the Centre Court at Wimbledon was televised by a new method on Monday. For previous transmissions of outdoor events there has been a cable link between the "camera" and Alexandra Palace, but in this case radio transmission was employed. The results were very satisfactory.

Irish Free State.—ARAN ISLANDS.—Cable communication between the Aran Islands and the mainland will not be resumed for some time. The cable was broken when a collier dragged its anchor six months ago, and about 600 yd. of new cable is required. The Post Office authorities have established temporary radio communication which is confined to telegraphy, and, as automatic calling cannot be provided, communication at scheduled times must be arranged.

Scotland.—TELEPHONE CABLE LAYING.—New Post Office telephone cables are being laid across Loch Awe from Portsonachan to Kilchrenan, the operation saving £30,000 as compared with the cost if the road were followed. The cables will form part of the new £250,000 telephone trunk route from Glasgow to Oban, which will become the telephone centre for the Western Highlands and the Hebrides. The new route provides ample capacity for many simultaneous conversations, and by means of amplifying equipment at Glasgow, Inveraray and Oban, the speech channels provided will be of a high grade. Extra wires are also provided for extension of the underground system *via* Connel and Ballachulish to Fort William and Inverness within the next twelve months. The trunk service to the Hebrides will be given by means of the ultra-short-wave radio telephone systems. Connection between Castlebay and Uist will be made by means of a £14,000 deep-sea cable. The manufacture and laying of the cables is being carried out for the Post Office by United Telephone Cables, Ltd., and in general charge of the work is Mr. J. J. McKichan, chief regional engineer of the Post Office in Scotland.

The island of Arran was linked with the mainland by radio-telephone on June 15th when Coastal Radio, Ltd., Edinburgh, gave a demonstration of their apparatus at Ardrossan Harbour and Brodick (Arran), where private stations had been set up.

United States.—CABLEGRAM RATES.—The Federal Communications Committee has ruled to the effect that the imposition of any artificial delay on ordinary cable messages is unjust and must be discontinued, while double rates for urgent cables are similarly condemned, according to the *Financial Times*. The effective date for the discontinuance of artificial delays is July 14th. The charging of double rates for urgent cablegrams will be forbidden on and after December 11th. In its ruling the Federal Communications Committee concedes the propriety of a premium rate for urgent messages, but holds that a double rate is excessive.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Argentina.—BUENOS AIRES.—July 16th. Argentine State Oilfields Directorate. Turbo-generator sets, boiler and auxiliary plant, electrical equipment, &c., for extensions to the power station at Comodoro Rivadavia. (T.Y. 23893/37.)*

Australia.—BRISBANE.—July 5th. City Electric Light Co. Relays to replace those existing at four sub-stations. (T.Y. 31392.)* 11,000-V switchgear, &c. (T.Y. 17779/37.)*

August 2nd. One set of h.v., d.c. testing equipment. (T.Y. 17848/37.)*

MELBOURNE.—July 13th. State Electricity Commission. Steel-cored aluminium conductors and sleeves. (T.Y. 23954/37.)*

SYDNEY.—July 29th. County Council. One 100-ton electrically operated travelling crane at Bunnerong power station. (T.Y. 24347/37.)*

Batley.—June 28th. Electricity Department. A.c. motors for change-over work. (June 18th.)

Beckenham.—June 28th. Borough Council. Coal. (June 4th.)

Birmingham.—June 28th. Baths Committee. Electric lighting and power installation, Kingstanding Baths. Secretary and commercial manager, Baths Department, Kent Street (deposit £2 2s.).

Bolton.—Corporation. Electrical and engineering services at the new Technical College. (See this issue.)

Brighton.—July 5th. Corporation. Boiler plant instrument and control panels for Southwick power station. (June 18th.)

Cullen (BANFF).—June 28th. Town Council. Electric street lighting equipment. Burgh surveyor, 1, Seafield Place (deposit £1 1s.).

Dagenham.—July 1st. Engineer and Surveyor's Department. Street fire alarm system. (June 18th.)

Dumfries.—July 6th. Electricity Department. Two 300-kVA transformers. (June 11th.)

Egypt.—CAIRO.—July 5th. Ministry of Public Works. 70-kW d.c. Diesel generating set. (T.Y. 31408.)*

Hawarden.—July 7th. Electricity Department. H.v. and l.v. overhead line and cable, pole transformer sub-station, and one 11-kV pole-mounted switch. (June 18th.)

Heston and Isleworth.—July 7th. Borough Council. Electric lighting and power installation at the proposed public swimming bath, Isleworth. (See this issue.)

Hoylake.—June 28th. U.D.C. Electrically driven borehole pumping plant at Newton pumping station. Water engineer, Town Hall.

Irish Free State.—DUBLIN.—July 31st. Electricity Supply Board. 110-kV and 38-kV switchgear and control equipment. (June 4th.)

July 26th. One 25,000-kVA transformer with on-load tap-changing equipment. (June 18th.)

Diesel alternator set for Pigeon House generating station. (See this issue.)

Leeds.—July 12th. Housing Committee. Wiring of houses on various estates. Mr. A. H. Linnett, housing director, 26, Great George Street (deposit £2).

Liverpool.—July 6th. Corporation. Meter testing equipment. City lighting engineer, 17, Highfield Street.

London. — WANDSWORTH. — June 28th. Borough Council. Wiring of houses, flats and maisonettes. (May 28th.)

WEST HAM.—July 2nd. Borough Council. Electrical installation at a new Colony for Mental Defectives, South Ockendon. (May 28th.)

July 12th. Twelve months' supply of coal. (See this issue.)

ST. PANCRAS.—July 8th. Meter boards, cookers, fires, washboilers and water heaters for one year. (June 18th.)

COMMISSIONERS OF H.M. WORKS.—July 9th. Rewiring I.R.O., 17, North Audley Street, W.1. (See this issue.)

Manchester.—July 5th. Electricity Committee. 6.6-kV, 3-phase, a.c. switchgear. (June 18th.)

July 9th. Supply and lagging of a main gas duct for two boilers at the Stuart Street power station. (See this issue.)

Middlesbrough.—June 28th. Electricity Department. Two 600-kVA transformers. (June 4th.)

Middlesex.—June 28th. County Council. Electric lighting, power, clocks, bells, wiring to telephone points, and service cables in blocks 11 and 12 at the Chase Farm schools; and lifts at Hillingdon County Hospital and Chase Farm schools. (June 4th.)

July 19th. Electrical installation at the new elementary school, Southall. (June 18th.)

Newcastle-under-Lyme.—July 6th. Electricity Supply Department. Three-phase 6.6-kV transmission line. (June 4th.)

Newcastle-upon-Tyne.—July 5th. Trade and Commerce Committee. Three electric capstans and eleven dollies. City engineer, Town Hall.

Newton-in-Makerfield.—July 10th. U.D.C. Electricity Department. One 400-kVA transformer. (See this issue.)

New Zealand.—WELLINGTON.—September 7th. Public Works Department. 5,000-kVA transformer bank. (T.Y. 17784/37.)*

Peterborough.—July 9th. City Council. Electrically driven circulating pump in connection with the installation of a new heating scheme at the Public Library. City Engineer's Office. Town Hall.

Portsmouth.—June 28th. Electricity undertaking. Cast-iron sea-water circulating water pipes. (June 11th.)

Preston.—July 6th. Electricity Department. House service type electricity meters, domestic water-heating apparatus, and breakfast cookers. (June 4th.)

Rhondda.—June 26th. Electricity Committee. Three-phase static transformers. (May 28th.)

Rhyl.—June 30th. Electricity Department. Lamp columns and fittings for promenade and gardens lighting scheme. (June 18th.)

Sheffield.—June 26th. Electricity Department. Two 750-kW glass bulb mercury arc rectifiers. (June 18th.)

July 3rd. Town Council. Wiring and fittings at seven schools. W. G. Davies, city architect, Town Hall (deposit £2).

July 13th. One 13-panel board for 33-kV switchgear. (See this issue.)

South Africa.—JOHANNESBURG.—July 19th. Railways and Harbours Administration. Twelve electric locomotives with electrical spares and alternative quotations for twenty-two electric locomotives with spares. (T. 2593.)*

August 3rd. One 3-ton and eight 5-ton overhead electric travelling cranes. (T.Y. 24344/37.)* Two 7-ton and two 150-ton overhead electric travelling cranes. (T.Y. 24343/37.)*

July 16th. Union Tender and Supplies Board. Line material. (T.Y. 23958/37.)*

July 17th. City Council. Stationary battery and equipment. (T.Y. 24345/37.)* One bank of 3,000 kVA transformers. (T.Y. 24269/37.)*

PRETORIA.—July 16th. Public Works Department. Three electric lifts. (T. 17817/37.)*

July 30th. H.v. and l.v. switchgear and a 250-kVA transformer. (T.Y. 17861/37.)*

July 22nd. Low temperature heating panels and thermostats. (T. 24034/37.)*

SOMERSET EAST.—July 28th. Municipal Council. Switchgear, meters, tranformers, transmission line material, &c., in connection with extensions to the electricity scheme. (T. 24074/37.)*

Southampton.—June 30th. Electricity Department. Flue dust pneumatic extraction installation. (June 18th.)

Tyldesley.—June 30th. U.D.C. Three pumps, complete with electric motors, automatic float controlled switchgear, &c., for the pumping station, near Miners' Arms, Astley. F. E. Jones, Council's engineer and surveyor, Town Hall (deposit £2 2s.).

Uruguay.—MONTEVIDEO.—July 19th. State Electricity Supply and Telephones Administration. Bare copper conductors. (T.Y. 31405.)*

August 13th. Fifty-four oil-cooled, 3-phase static transformers (6.000/230 V). (T.Y. 23892/37.)*

September 6th. Port Administration. Eight electric half-gantry cranes. (T.Y. 23949/37.)*

West Riding.—June 28th. County Council. Electric lighting and heating installation at Mexborough Technical Institute. Electric lighting installation at Whitwood Mining and Technical Institute. Education officer, County Hall, Wakefield.

Wolverhampton.—July 5th. Transport Department. Traction poles. General manager, Corporation Transport Department, Cleveland Road.

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Blackburn.—Accepted. Electrical installations at St. Anne's Church and school, Fence.—Reedley Electrical Co.

Brechin.—Town Council. Accepted. Electric lighting of forty-eight houses at Last Mile Road.—J. Davidson .

Darlington.—Town Council. Accepted. Cables.—Callender's. Transformers.—Electric Construction Co.

Glasgow.—CORRECTION.—Owing to a printer's error the contract for transformers for the Electricity Committee mentioned on page 940 of our last issue read incorrectly. The correct version is as follows:—Transformers at a cost of £14,944. Four 800-kVA, six 400-kVA and nine 200-kVA.—British Electric Transformer Co. Fourteen 800-kVA and nine 200-kVA.—Bruce Peebles.

Grange.—U.D.C. Accepted. Laying an e.h.v. feeder from Kents Bank Road to Grange Fell, together with transforming and switching kiosks (£707).—Johnson and Phillips.

Hyde.—Housing Committee. Accepted. Electric lighting in houses on Victoria Street and Mill Lane estates.—Johnson & Turner.

Lanarkshire.—County Council. Accepted. Electrical work in connection with 116 houses and other buildings at Bargeddy (£783).—D. Henderson.

London.—BATTERSEA.—Electricity Committee. Recommended. Four feeder pillars (£177).—Henley's.

HAMMERSMITH. — Electricity Committee. Recommended. Switchgear and metering equipment in connection with the supply of electricity to Lancegaye Safety Glass (1934), Ltd., Hythe Road (£660).—J. G. Statter & Co.

STOKE NEWINGTON.—Electricity Committee. Recommended. Installation of rising mains in flats now in course of erection on the sites of Paradise House, Glebe Place, Marlborough House (£674).—City Electrical Co. This company will also undertake similar work in flats at Amhurst Court if the work is not carried out by Amhurst Court, Ltd. Fifty d.c. meters.—Measurement, Ltd.

WESTMINSTER.—Highways Committee. Recommended. Traffic signals at four junctions (£3,024).—Automatic Telephone & Electric Co.

L.C.C.—Mental Hospitals Committee. Electrical installation, &c., at the Maudsley Hospital extension:—

	£		£
Read and Partners, Ltd. (Accepted)	**8,112**	Buchanan and Curwen, Ltd. ...	9,750
Samuel Reed & Sons	8,209	Alexander Hawkins & Sons ...	9,899
W. J. Furse & Co. (London) Ltd.	9,400	Bell Bros. & Co., Ltd.	9,925
Pinching and Walton	9,660	Blackburn, Starling & Co., Ltd.	9,986
H. J. Cash & Co., Ltd.... ...	9,737	Troughton and Young, Ltd. ...	10,150
		City Electrical Co.	10,301

The chief engineer's comparable estimate is £8,300. Pending a decision as to whether certain work provided for in the specification shall be done, the lowest tender has been accepted less an agreed amount of £1,100. The amount of the accepted tender is thus £7,012. To the cost of the work to be done under contract must be added a sum of £172 for the provision of wireless headphones and electric sterilisers and for certain incidental works, giving a total expenditure for electrical services of £7,184.

Wiring and fittings for electric lighting, power and clocks, and alterations to fire alarm system at South-Eastern Hospital and Ambulance Station, New Cross:

	£		£
Archibald Mackhenik. (Accepted)	**1,426**	Electrical Installations	1,614
A. J. Hewens & Sons	1,565	Gillham and Jones	1,616
F. G. Edey & Co.	1,594	B. French	1,617
City Electrical Co.	1,598	Francis Polden & Co.	1,620
Blackburn, Starling & Co. ...	1,601	Berkeley Electrical Engineering	
T. Clarke & Co.	1,602	Co.	1,710
Pinching & Walton	1,607		

Wiring and fittings for additions to the automatic telephone system, Lambeth Hospital:

	£		£
Leonard G. Tate & Co. (Accepted)	**1,442**	W. J. Furse & Co. (London) ...	1,817
G. E. Taylor & Co.	1,675	Reliance Telephone Co.	*1,840
Francis Polden & Co.	1,690	Alexander Hawkins & Sons ...	2,090
Samuel Reid & Sons	1,730	Pinching & Walton	2,189

* Qualified.

Provision and erection of two electric bed-lifts, St. Bernard's Hospital:

	£		£
Waygood Otis. (Accepted) ...	**1,922**	J. and E. Hall	2,219
Marryat and Scott	2,190	Pickering, Ltd.	2,245
Express Lift Co.	2,208		

Wiring and fittings for electric lighting in pavilions and huts, Northern Hospital, Winchmore Hill:

	£		£
G. E. Taylor & Co. (Accepted)...	**1,068**	Leonard G. Tate and Co.... ...	1,342
B. French	1,108	Grant and Blake...	1,348
City Electrical Co.	1,111	Arthur Cozens	1,354
Malcolm and Allen (London) ...	1,199	F. H. Wheeler & Co.	1,355
Pemberton and Sturgess (Great Britain)	1,277	Holliday and Son (Electrical) ...	1,463
F. G. Edey and Co.	1,335	Davis Myer and Co.	1,540

Wiring and fittings for electric lighting and power in Block A and patients' lamp and call bell systems in the side wards of Blocks A, B and C, New End Hospital, Hampstead:

	£		£
G. E. Taylor & Co. (Accepted)...	**1,189**	Jacob, White and Co.	1,311
William Steward and Co. ...	1,256	J. E. Swann and Co.	1,312
Gillham and Jones	1,290	W. H. Gaze and Sons	1,340
Read and Partners	1,305		

Middlesex.—Health Committee. Electrical installation and improvements at Central Middlesex Hospital:

	£		£
G. E.Taylor & Co. (Recommended)	**2,216**	G. A. Weston	2,843
Building and Colliery Supply Co.	2,380	Constable, Hart & Co.	2,886
Central Electric Co.	2,427	Atozed (Kingston)	2,989
Slough Electrical Co.	2,553	G. W. Cross & Co.	3,117
F. H. Wheeler & Co.	2,604	Houchin, Ltd.	3,261
Courtney, Pope & Co.	2,626	Marryat and Place	3,418
Page and Girling	2,797	Michael Son & Caine	4,200

Rawtenstall.—Electricity Committee. Accepted. Cables for twelve months.—Henley's.

Renfrewshire.—County Council. Accepted. Electrical work at the extension of Thornley Park school.—J. Bell & Sons. The extension scheme is to cost £5,000.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, July 1st. Natural History Museum, South Kensington, S.W. 8.30 p.m. Annual conversazione. Wednesday, July 7th. Institution, London. Conversazione to overseas members.

South Midland Centre.—Thursday, July 8th. Summer meeting. Visit to Pirelli General Cable Works, Ltd., Eastleigh.

Association of Supervising Electrical Engineers (*London Branch*).—Saturday, June 26th. 2.30 p.m. Visit to the Pinewood Studios, Iver.

Junior Institution of Engineers.—Saturday, June 26th. Summer excursion to Stratford-on-Avon and district.

Royal Sanitary Institute.—July 12th-17th. Birmingham. Health Congress.

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

FE-NI-CA accumulator.
LAMBERT spacing saddles.
PHANTOM light signs.
EXCELSIOR electric sterilisers.
EMBE time lag device.
KLINOSTICK fountain pen type torch with tapped switch in base.

Readers should enclose stamped addressed envelopes when making their inquiries.

Notes

Inquiry

A correspondent inquires for the present maker, if any, of a process of covering electrical magnetic wire invented by Messrs. W. A. Phillips and F. Hutchins, whose address was Crescent Works, Harlesden, when the process or machine was described in the ELECTRICAL REVIEW of December 1st, 1905, page 889—rather a long time ago!

I.E.E. North-Western Students

The annual summer visit organised for members of the North-Western Students' Section of the I.E.E. was held on June 19th to the works of Samuel Fox & Co., Ltd., at Stocksbridge. A party of fifty-four members and ladies travelled by private coach and cars from Manchester to Stocksbridge, where, under the guidance of Mr. O. Inman, the chief engineer, and members of his engineering staff, the works were toured for nearly two hours. The party was entertained to tea by the company, after which the members proceeded to the Rising Sun Hotel, Bamford, for swimming, dinner, dancing and a social evening.

I.E.E. Golf Tournament

The North-Western Centre of the Institution of Electrical Engineers held its annual golf tournament in aid of the Benevolent Fund at the Sandiway Golf Club on June 16th. The Manchester Challenge Cup, presented by Mr. H. H. Berry, was won by Mr. H. Coulson Crawford. It is anticipated that a sum of £100 will be handed over to the Benevolent Fund.

Turbo-electric Liners

The Norddeutscher-Lloyd turbo-electric liners *Scharnhörst* and *Potsdam* have completed more than a year's service on their owner's East Asiatic service. They are the first German-built sea-going ships to be fitted with a turbo-electric system of propulsion. The vessels are 652 ft. long and approximately 18,000 tons gross. The propelling machinery in each consists of two 3,120-r.p.m. turbo-alternators of 10,000 kW normal and 12,500 kW maximum capacity, which deliver energy at 3,120 V to two 13,000-s.h.p. motors driving the propellers at 130 r.p.m. to give a speed of 21 knots. Steam is generated in four Wagner-Deschimag oil-fired water-tube boilers, the steam conditions being 711 lb. per sq. in. gauge and 878 deg. F. The electric control gear was made by the B.T.H. Co. A report just published shows that such difficulties as have been experienced are due either directly or indirectly to the use of high-pressure, high-temperature steam, the electrical equipment itself causing no trouble and proving itself to be simple to operate. A sister ship, the *Gneisenau*, which has geared turbines, has a higher efficiency of transmission than the electrically propelled ships with their double energy-conversion losses in generators and motors, although this is more than balanced by the constancy of the propeller speed when the vessel is pitching in a seaway. Moreover, the use of only one fully loaded generator to supply both motors at cruising speeds improves the efficiency of propulsion, with the result that in the course of a complete voyage to and from the Far East there is a saving of fuel of the order of 8 per cent. in favour of the electrically propelled ships.

An Italian Electric Kitchen

The performance of the recently electrified kitchen of the Opera Pia Taparelli di Saluzzo is being followed with some interest in Italy. It is an experimental installation and was only authorised after tests had been made with a small temporary installation. It is one of two kitchens in the building, the other containing cooking equipment heated by coal fires. In this way it is possible to obtain a comparison of the costs. The electric kitchen, two illustrations of which appear on page 964, has a large range with nine hot-plates varying from 1 kW to 2.8 kW each, and two roasting ovens of 3.5 kW each. In addition, there are an electric frying pan of the tipping type (7.5 kW), two tipping cooking pans (6 and 10 kW), two electric water heaters and a refrigerator, making the total connected load of the kitchen about 50 kW. The consumption has been found to be about 958 kWh per week for an average of about 160 persons. This includes energy consumed by the water heaters, refrigerator and electric irons; for purely cooking purposes the consumption is about 100 kWh or 625 Wh per person per day.

Appointments Vacant

Evening lecturer in electrical installation at the Municipal College, Stratford, E.

Mechanical and electrical engineer for the Government of the Gold Coast.

Temporary mechanical and electrical assistants for the drawing office of the Air Ministry and R.A.F. Aerodromes.

Two outside representatives for Hammersmith Electricity Department.

Assistant saleswoman-demonstrator for Bromley Electricity Department.

Technical assistants for the L.C.C.

Teacher in electrical installation work at Battersea Polytechnic.

Assistant switchboard attendant for the Lancashire Electric Power Co.

Distribution engineer for the West Hampshire Electricity Co., Ltd.

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Alderman J. Chuter Ede, J.P., D.L., M.P., chairman of the London and Home Counties Joint Electricity Authority, and President of E.D.A., and **Alderman Dudley Stuart,** vice-chairman of the London and Home Counties J.E.A. and member of the E.D.A. Council, have been presented with the freedom of the Borough of Wimbledon. Ald. Chuter Ede has been a member of the Surrey County Council for many years and recently relinquished the chairmanship, while Ald. Dudley Stuart has been a member of the Wimbledon Borough Council for thirty years.

Mr. J. McFetridge, of the Diesel Traction Department of Sir W. G. Armstrong Whitworth & Co., and formerly with the Traction Research Department of the English Electric Co., has returned from the Middle East and is at present on holiday.

Mr. F. W. H. Wheadon, managing director and chief engineer of the Adelaide Electric Supply Co., has been awarded the Kernot Memorial Medal by the Committee of Assessors of the University of Melbourne for distinguished engineering achievement in Australia. The award has been made for Mr. Wheadon's work for the Adelaide Electric Supply Co. during the past thirty-five years. He is the second South Australian to receive the medal, the first being Sir Robert Chapman, Professor of Engineering at the Adelaide University in 1927. The medal was established as a memorial to the late Mr. William Charles Kernot, first Professor of Engineering at the Melbourne University.

Mr. W. H. Dunkley, at present engaged as operation superintendent with the Central Electricity Board (South-West England and South Wales Area), has been appointed personal engineering assistant to Mr. J. N. Waite, city electrical engineer, Hull, at a salary of £750 per year. Mr. Dunkley will succeed Mr. G. O. McLean, who has been appointed deputy borough electrical engineer and general manager to the Ealing Borough Council.

Mr. A. J. Fippard, M.I.E.E., has joined the board of the Electric Supply Corporation. Mr. Fippard was for many years with Edmundson's Electricity Corporation and he recently resigned from the position of general manager of that company.

Mr. A. Gordon Smith, D.L., chairman of Smith's English Clocks, Ltd., succeeded in winning the Gold Vase at Ascot on June 15th, with his horse Fearless Fox.

Mr. A. C. Pearse, manager of the Illumination Department of the British General Electric Co., Ltd., Melbourne, recently left Australia for England.

Lt.-Col. S. E. Monkhouse, M.I.E.E., general manager and a director of the North-Eastern Electric Supply Co., Ltd., has resigned his commission with the Tyne Electrical Engineers (T.A. Reserve), and retains his rank.

Baron Pender, of Porthcurnow, in the County of Cornwall, is the title taken by Mr. J. C. Denison Pender upon his elevation to the peerage.

Mr. D. H. Abbott, A.M.I.E.E., of the Todmorden electricity works, has been appointed consumers' manager to Crewe Corporation Electricity Department. He has been presented by his colleagues at Todmorden with an electric clock.

Mr. W. S. Barrett, assistant engineer in the Testing Department of the County of London Electric Supply Co., Ltd., Barking, has been appointed technical assistant in the Meter Department of the Metropolitan Electric Supply Co., Ltd.

Mr. J. L. Brown, who was for some years with the General Electric Co., Ltd., Witton, Birmingham, as sales engineer, has now joined the staff of Gothic Electrical Supplies, Ltd., of Birmingham.

Mr. John Frederick Young, London depôt manager of Ensign Lamps, Ltd., was married on Friday last to Miss M. de Bohun Lipscomb.

Mr. D. L. Gore, who is on the electrical staff of Marconi's Wireless Telegraph Co., Ltd., Chelmsford, has been presented by the staff with a dinner service, on the occasion of his marriage to Miss E. M. Blake, of Broomfield.

[*Jerome, Ltd.*

Mr. J. L. Brown

Mr. L. M. Cattley, superintendent at the Roath power station, Cardiff, retired on June 19th, when a complete angler's outfit and a wallet of Treasury notes were presented to him by Mr. E. Jones (city electrical engineer) on behalf of the station staff. Mr. Cattley has been associated with the undertaking for thirty-four years.

Obituary

Sir Eric Geddes.—Sir Eric Geddes, who died at his home at Hassocks, Sussex, on Tuesday last at the age of 61 years, first came into direct touch with the ELECTRICAL REVIEW when he was on the staff of the North-Eastern Railway under Sir George Gibb. He was then engaged upon schemes for attracting new industries to the area covered by that railway and sought our co-operation in the hope that new electrical works would be opened up. Later, when the War was at its height, he was called to positions of eminence in connection with munitions, transport, &c., by Mr. Lloyd George's Government. He was an experienced expert in transport organisation, and after the War he was appointed Minister of Transport. His sweeping proposals for bringing about public economies—"Geddes cuts" they were called—included the shutting down of the Department of Overseas Trade, but the business world did not concur in this suggestion and the Department was saved. Subsequently he became chairman of certain great industrial undertakings and a president of the Federation of British Industries.

Wing-Commdr. Sir Norman R. A. D. Leslie, Bt., formerly joint manager of Cable & Wireless, Ltd., died on June 16th at the age of forty-eight. After leaving the Air Force he became secretary to the Imperial Wireless and Cables Conference in 1928, and from 1929 to 1933 he was secretary to the Imperial Communications Advisory Committee. While holding this appointment he became joint managing director of Cable & Wireless, from which position he retired in June last year to devote himself to Imperial defence matters.

Members of the Institution of Mechanical Engineers at the works of the Brush Electrical Engineering Co., Ltd., Loughborough, during their summer meeting which was held recently at Leicester

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares.

New Companies Registered

Luxram Electric, Ltd.—Private company. Registered June 14th. Nominal capital, £50,000. Objects: To carry on the business of manufacturers of and dealers in electric lamps and electrical accessories and apparatus, electric glassware and fittings, appliances and sundries of all kinds, and all electrical accessories, appliances and apparatus used in connection with radio, television or telegraphy, &c. The life directors are: J. Waimann, 134, Bethune Road, Stamford Hill, N. (director of Luxram Lamp Works (Holdings), Ltd.), and D. Wineman, of the same address (director of Vacuum Lamp Co., Ltd.). Solicitors: H. C. Morris Woolsey & Co., 2, Walbrook, E.C.4.

Frederick Victor (1937), Ltd.—Private company. Registered June 16th. Capital, £500. Objects: To carry on the business as merchants, brokers, commission agents, importers, exporters and manufacturers of and dealers in electrical and wireless goods, &c. The drectors are: E. Victor Bowers, Chapel Fields, Addlestone, Surrey, and L. Bowers, 70, Bowring Park Avenue, Liverpool. Registered office: 163, Dale Street, Liverpool.

Capital Electrical Industries, Ltd.—Private company. Registered June 12th. Nominal capital, £500. Objects: To carry on business as patentees, and manufacturers of and dealers in electrical, mechanical or scientific apparatus, equipment and devices of all kinds for use in all commercial, industrial and private undertakings. &c. The subscribers are: H. W. Pook, Widmore Lodge Hotel, Widmore Road, Bromley, Kent, and K. P. Frampton, 50, Pall Mall, S.W.1. H. W. Pook is to be one of the first directors.

Battery Services (Eastbourne), Ltd.—Private company. Registered June 16th. Capital, £5,000. Objects: To carry on the business of makers and repairers of and dealers in electrical and/or chemical appliances and goods; engineers, &c. The directors are: W. S. Jennings, 276, Droylesden Road, Newton Heath, Manchester, and Miss A. Jones, One Ash, Church Lane, Marple, Ches. Registered office: 8a, St. Leonards Road, Eastbourne.

Portable Combustion Machines, Ltd.—Private company. Registered June 19th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in all kinds of electrical and non-electrical machines, implements, tools, apparatus, and equipment, &c. The subscribers are: L. Walden, 34, Hendale Avenue, Hendon, N.W.4, and G. B. Atwater, 26, Belsize Road, Hampstead, N.W.6. L. Walden is the first director. Registered office, 457, Finchley Road, N.W.3.

Lexington Instrument Laboratories, Ltd.—Private company. Registered June 18th. Capital, £100. Objects: To carry on the business of manufacturers and vendors of electrical, chemical and mechanical equipment and instruments, &c. The directors are: D. Myers, 88, Uxbridge Road, Ealing, W, and two others. Registered office: 155-157, Great Portland Street, W.1.

Electric Truck and Battery Co., Ltd.—Private company. Registered June 18th. Capital, £1,000. Objects: To carry on the business of manufacturers of and dealers in electric vehicles, motor cars and lorries, tractors, steam engines and any other vehicles, wireless apparatus, &c. The permanent governing directors are: E. J. Rose, 34, Brook Street, Holborn, W.C., and P. W. Taylor, 92, New Cavendish St., W.1. Secretary: Arthur Ball. Registered office: 25, Bloomsbury Square, W.C.1.

Sign Services, Ltd.—Private company. Registered June 17th. Capital, £500. Objects: To carry on business as manufacturers of and dealers in signs and advertisements, electrical appliances, accessories and fittings of all kinds, &c. The directors are: H. A. Haggis, 17, Holmefield Avenue, Liverpool, 19; and H. J. E. Haigh, 107, Stalisfield Avenue, West Derby, Liverpool, 11. Registered office: 36, Dale Street, Liverpool.

Returns of Electrical Companies

County of London Electric Supply Co., Ltd.—Particulars have been filed of debenture stock for £8,500,000 (inclusive of £8,000,000 already registered) authorised by resolutions of April 25th, 1927; July 31st, 1930; May 19th, 1931; Jan. 27th, 1932; April 21st, 1936; and May 25th, 1937, and covered by trust deed dated June 4th, 1937 (supplemental to trust deeds dated May 19th, 1927; August 21st, 1930; May 29th, 1931; February 4th, 1932 and April 30th, 1936). Property charged: The company's undertaking and property, present and future, including uncalled capital. The amount of the present issue is £500,000. Trustees: Electric & General Investment Co., Ltd., and Law Debenture Corporation, Ltd.

Lancashire United Transport & Power Co., Ltd.—Capital, £600,000 in 300,000 preference and 300,000 ordinary shares of £1. Return dated March 12th, 1937. 300,000 preference and 276,208 ordinary shares taken up. £101,306 paid. £474,902 considered as paid. Mortgages and charges: £250,000 stock (a further £50,000 of the stock has been deposited as security for possible advances).

Gent & Co., Ltd.—Capital, £50,000 in 20,000 preference and 30,000 ordinary shares of £1. Return dated March 9th, 1937. 7,427 preference and 24,376 ordinary shares taken up. £13,387 paid on 3,957 preference and 9,430 ordinary shares. £18,416 considered as paid on 3,470 preference and 14,946 ordinary shares. Mortgages and charges, £9,000.

Isle of Thanet Electric Supply Co., Ltd.—Capital, £500,000 in 282,000 6 per cent. preference, 150,000 ordinary and 68,000 unclassified shares, all of £1. Return dated April 21st, 1937. All preference and ordinary shares taken up. £222,000 paid on 222,000 preference shares. £210,000 considered as paid on 60,000 preference and 150,000 ordinary shares. Mortgages and charges, £250,271.

Electric Heaters, Ltd.—Capital, £100 in £1 shares Return dated June 7th, 1937. All shares taken up. £100 paid. Mortgages and charges, nil.

Oriental Telephone and Electric Co., Ltd.—Satisfaction to the extent of £118,744 on June 8th, 1937, of debenture stock secured by trust deed dated June 28th, 1905, and supplemental deed of acknowledgment dated June 12th, 1907, and registered July 11th, 1905, and June 20th, 1907.

Musselburgh and District Electric Light and Traction Co., Ltd.—Satisfaction in full on April 21st, 1937, of debenture dated October 1st, 1928, and registered October 9th, 1928, securing £7,000. (Notice filed June 11th, 1937.)

Simmonds & Stokes, Ltd.—Issue on June 14th, 1937, of £750 second debentures part of a fourth series already registered.

Excel Electrical Equipment Co., Ltd.—Capital, £3,000 in £1 shares. Return dated December 31st, 1936 (filed June 6th, 1937). 600 shares taken up. £600 paid. Mortgages and charges: nil.

Macfarlane Electrical Co., Ltd.—Capital, £3,000 in £1 shares. Return dated December 31st, 1936 (filed May 3rd, 1937). All shares taken up. £3,000 paid. Mortgages and charges: nil.

Vio-Ray Electric Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1936 (filed January 15th, 1937). 377 shares taken up. £377 paid. Mortgages and charges, nil.

Ray-Burn Electrics, Ltd.—W. H. Hawkes, incorporated accountant, of 152, Palmerston Road, Bowes Park, N.22, was appointed receiver and manager on June 3rd, 1937, under powers contained in debenture dated September 20th, 1936.

Associated P. A. Equipments, Ltd.—The nominal capital has been increased by the addition of £1,000 in £1 "A" ordinary shares beyond the registered capital of £1,000.

Silvagray Electric, Ltd.—The nominal capital has been increased by the addition of £1,000 in £1 5 per cent. cumulative preference shares beyond the registered capital of £4,000.

Gorseinon Electric Light Co., Ltd.—Capital, £60,000 in £1 shares. Return dated March 15th, 1937. All shares issued and fully paid up. Mortgages and charges, nil.

City Notes

The General Electric Co., Ltd., reports profits for the year ended March 31st of £1,604,512, as compared with £1,485,153. To this is added £680,495 brought in, making £2,285,007, from which the following deductions are made:—Depreciation, £343,248; directors' remuneration, £4,836; contribution to pension fund, £45,569; preference stock dividend, £190,569; taxation reserve, £275,000; and reserve, £125,455. The ordinary dividend for the year is maintained at 10 per cent., and a bonus of 7½ per cent. is also paid (against 5 per cent.), making total distribution 17½ per cent. (against 15 per cent.). The balance carried forward is £749,294. The report states that the trading results reflect the continued prosperity of the home market and the growing recovery in markets overseas. The company's works have been employed to full capacity. The inflow of orders has been satisfactory, while the high level of output has been secured in spite of a shortage of skilled labour and the difficulty of obtaining raw materials. The continued progress and reorganisation in industry generally have largely contributed to the activity in the engineering works, while the telephone works benefited by the extension and modernisation of telephone facilities at home and abroad. Extensions to works and branches have been carried out in accordance with the programme, and further expenditure is still required for this purpose. In spite of the activity in the home market, the directors have kept before them the necessity for extending export business. The volume of orders and shipments has shown further improvement. The overseas branches in South Africa, India, Australia, New Zealand, Malaya, and Argentina show satisfactory results, but trading conditions in France and China have remained very difficult. An issue of 381,670 ordinary shares at £3 per share was made during the year. The proceeds have been mainly absorbed in the increase of stock and work-in-progress, and also, to some extent, in additions to buildings and plant. The reserve account now stands at £4,400,000. The number of employés has risen to 38,035, an increase of 4,000 over last year. The contributory pension fund has shown further expansion. Its members now number 7,500, and the assets held by its trustees have reached a total of £1,525,379. With the report the company has issued a booklet outlining the progress made during the year and illustrating some installations for which the company supplied plant. Meeting: July 1st.

The Chloride Electrical Storage Co., Ltd., held its annual meeting on Friday last when Mr. W. S. Naylor (chairman), who presided, said that the business of the company and its subsidiaries had been well maintained and a further substantial increase in turnover could be reported. The principal advance in production costs was brought about by the increase in the cost of lead which at the beginning of 1936 was £15 per ton, in October last £20 per ton, and in March, 1937, £36 per ton. The price now stood at about £22 per ton. They had experienced a rapid rise in sales of "Exide Double-life" batteries for motor cars and aircraft. Special equipment using "Exide-Ironclad" batteries for ground starting of aeroplane engines had been developed. There was continued progress in the sale of "Drydex" batteries. The revival of the electric vehicle had continued. In 1936 registrations of small commer-

cial electric vehicles had increased by 70 per cent., and they could claim that the great bulk of all electric vehicles on the road were operating on their batteries, or those of their subsidiaries. "Exide-Ironclad" batteries were also in service on the Cowes ferry. Recently they had received an order from the Danish Navy for three large "Exide" batteries for use on submarines.

With regard to the future the current year was progressing satisfactorily, and to date their output compared favourably with that of last year.

The Revo Electric Co., Ltd., held its annual meeting on June 22nd, when Mr. B. Silcock (chairman), who presided, said that electricity reorganisation was now under the consideration of the Government following the Report last year of the McGowan Committee, and they, as a company, were mainly interested in the effect that the final proposals would have on the cost of electricity distribution. With cheaper and wider distribution of power industrial consumption must rapidly expand. Consistent progress was being made in the generation of electricity from year to year, and they were taking their part in the production of electrical equipment necessarily following on such development. With record orders on the books they were extending the factory in all directions—cooker shops, foundry, enamelling department, switch and fuse department and plating and polishing shop—to the extent of a further 10,000 ft. of floor space, in an effort to cope with the ever-increasing demand for their normal products. Their order book at the end of May showed a substantial increase as compared with May of last year, while sales for the first two months of the current year showed an increase of about 20 per cent. Given normal trading conditions and freedom from international or political complications they would be able to more than hold their own, and they could look forward with every confidence to another successful year.

Telephone Rentals, Ltd., held its annual meeting on June 17th, when Mr. F. T. Jackson (chairman and managing director), who presided, said that their subsidiary companies had again had a successful year, and the British telephone installation companies all made a trading profit during 1936. They had made various grants to these companies to enable them to continue their intensive sales campaign, with satisfactory results. The year under review had been one of expanding trade in nearly every direction, with the result that they had established a new high record in additional business secured during the year. The capital outlay necessitated by the increased business had been very considerable. During 1936 they extended their "Chronomatic" service. The launching of a new service of this kind was an expensive matter, but its reception had been satisfactory, and all costs of development had been written off in the accounts of their subsidiary companies before striking the profits. The trading results of all their subsidiaries operating in this country were satisfactory over the first five months of the current year.

The company proposes to make at an early date a further issue of shares to members, increasing the issued capital from £700,000 in 5s. shares to £800,000.

The British Electric Traction Co., Ltd., held its annual meeting on June 18th, when Mr. J. S. Austen (chairman) who presided, protested against the Government's proposals for implementing the McGowan Report. He said that the company owned a number of electricity undertakings and constructed them under the protection of an Act of Parliament. It came as a shock to them when they found that that Act, which embodied an agreement, was going to be torn up as if it were a scrap of paper. It was true they were to get some compensation for it, but that compensation was in effect to be fixed by the Electricity Commissioners who were, to all intents and purposes, responsible for the scheme. The scheme conferred upon the Commissioners an amount of bureaucratic control which had yet to be improved upon. They were appearing to act as planners of the scheme, judges, valuers, and were to have a final decision on practically every detail. Further than that, the present efficient management of the various electricity undertakings was to be scrapped and the management in future would be appointed by the Minister of Transport in consultation with the local authorities.

Guest, Keen & Nettlefolds, Ltd.—Presiding at the annual meeting held on June 22nd Mr. S. R. Beale (chairman and managing director) said that in each of the four works of Joseph Sankey & Sons, Ltd., the turnover showed an increase of business in 1936 over that of the previous year. At the Albert Street works at Bilston a new dispatch department, finished stock warehouse and steel warehouse equipped with every modern facility was nearing completion, and the electro-plating shop was being entirely re-equipped. At Bankfield the additional shops erected in 1935 had been fully equipped, and had proved of the greatest value in enabling them to keep pace with increased requirements for electrical and wireless transformer stampings.

The United River Plate Telephone Co. reports a net revenue for 1936, after providing for debenture interest, of £303,616, as compared with £296,504 for 1935. After deducting the preference dividend and the interim ordinary dividend, and adjustment for additional provision for depreciation for the period July 1st, 1930, to December 31st, 1935, less credits, there is a balance of £19,555. To this is added balance from general reserve, £566,138, and £103,800 brought in, making £689,493. The final ordinary dividend is 3 per cent., making 4 per cent. for the year (against 6 per cent.), and £461,493 is carried forward.

The Electric Furnace Co. reports a net profit for the year ended March 31st of £30,417, as compared with £24,491 in the preceding year, to which is added £3,696 brought in. The final dividend on the preferred ordinary shares is 4½ per cent., making 8 per cent. for the year (against 7 per cent.), and on the ordinary shares 5½ per cent., making 8 per cent. (7 per cent.). Tax reserve receives £1,000, reserve for depreciation of investments £1,000, and general reserve £12,500. The balance carried forward, subject to directors' remuneration, is £6,513.

The Globe Telegraph & Trust reports a net revenue of £219,557 for the year ended May 31st, as compared with £195,449 for 1935-36. The final ordinary dividend is 5s. per £10 share, making a total distribution of 5½ per cent. net (against 4½ per cent., net), and £128,538 is carried forward. The report states that the company has agreed to the scheme of reconstruction proposed by Cable & Wireless (Holding), Ltd.

John Ismay & Sons report a trading profit for the year ended March 31st of £45,088, as compared with £39,418 for 1935-36. The net surplus on the sale of investments and other income was lower, resulting in a slight reduction of the net profit from £43,329 to £42,661. Income-tax reserve receives £1,000, and it is proposed to maintain the ordinary dividend at 45 per cent., leaving £7,924 to be carried forward (against £6,263 brought in).

The Rangoon Electric Tramways & Supply Co., Ltd.—Particulars of this company have been published for information only. It is redeeming the 5 per cent. mortgage debenture stock, and has created £200,000 4 per cent. mortgage debenture stock at 102½ per cent. redeemable 1942-52, which has been offered on conversion terms to the holders of the 5 per cent. stock.

The East India Tramways Co. is holding a meeting on July 8th to consider a resolution to increase the capital to £135,000 by the creation of 25,909 £1 shares, ranking *pari passu* in all respects in the existing shares. It is also proposed to capitalise £33,334, part of the reserve and renewals accounts, and apply it in distributing 33,334 fully-paid shares of £1 in the proportion of one for every three shares now held.

Edgar Allen & Co., Ltd., report a profit of £54,756 for the year ended March 31st as compared with £32,182 in the preceding year, to which is added £23,762 brought in. The ordinary dividend for the year is 7½ per cent., less tax (against 5 per cent.), general reserve receives £12,500 and staff pension fund £5,000. The balance carried forward is £33,420.

The Electric & General Investment Co. reports a net profit for the year ended May 31st of £4,373, as compared with £3,456 in the preceding year, to which is added £17,956 brought in. The final ordinary dividend is 5 per cent., making 7½ per cent., less tax (same), and £18,935 is carried forward.

Mirrlees, Bickerton & Day, Ltd., report a net trading profit for the year ended March 31st of £11,920 as compared with a loss of £8,867 for 1935-36. The ordinary dividend for the year is maintained at 2½ per cent., and £1,762 is carried forward.

Newman & Watson, Ltd., are paying a final dividend of 2½ per cent., making 7½ per cent., less tax, in respect of the period to March 31st, 1937.

Thomas De La Rue & Co. are paying a dividend of 8 per cent. for the year to March 27th (against 6½ per cent.).

Thorn Electrical Industries, Ltd., has announced the half-year's dividend on the 6 per cent. cumulative preference shares.

International Combustion, Ltd., is paying an interim dividend of 7½ per cent., less tax (same).

The General Electric Co. of U.S.A. is paying a quarterly dividend of 40 cents per share.

Stocks and Shares

TUESDAY EVENING.

ANOMALY persists through the daily evidence of increased prosperity on the part of national trade and industry, while, on the other hand, Stock Exchange markets maintain a condition of stagnation and dullness that finds reflection in most departments. Gilt-edged stocks are returning to the level of a 3½ per cent. yield. Already this is nearly obtainable from investment in the 3½ per cent. War Loan. The stocks and shares in the industrial companies, in spite of the excellent results reported by such companies as the General Electric, are heavy and depressed. Abundance of money is still available, but this fails to galvanise into activity markets connected either with investment or speculation.

General commendation, with reservations, is accorded to the new N.D.C. proposals. An uneasy feeling is left, however, in the minds of investors in ordinary shares that the new tax will make a considerable inroad into the profits of the companies affected. Abroad, the strikes in America, the French financial crisis and the continuance of hostilities in Spain make contributory causes to the caution with which money regards Stock Exchange markets. The industrial stage is set for recovery in the prices of stocks and shares, but the public decline to come forward with that support which is necessary before the present depression can be dispelled.

Fixed Interest Securities

The profits tax in its new form leaves holders of fixed-interest stocks still immune from special contribution to national defence expenditure. Reassurance on that point quickened the investor's post-Budget partiality for such securities. Although Government and other gilt-edged stocks are having to contend with depressing influences, good-class industrial debenture and preference issues continue in short supply. The question of the course of future interest rates, which was exercising only a few months ago so depressing an influence on safety-first securities as a class, is nowadays less in evidence. Now that taxation, amongst other considerations, has taken some of the colour from the outlook for equity shares investment is in the mood to seek reliability of income rather than capital appreciation with concomitant risks.

Industrial Markets

Removal of the old profits tax and substitution of the new had a beneficial effect on sentiment in industrial markets. As regards share prices and business activity, the response was disappointing to those who had looked for immediate improvement on the clearing up of uncertainty in that direction. A heavy imposition on industrial profits, even when contrasted

with something in far less pleasant form, could scarcely be expected to act the part of a stimulant. The market is, nevertheless, enabled accurately to size up the situation and is in much better trim to welcome the appearance of encouragement in less negative shape. In the interim, unemployed money, which must be piling up very rapidly, continues to regard with some mistrust the outlook for industrial ordinary shares. Pessimism has found a fruitful breeding ground during the nervous apathy of the last few weeks. Stock Exchange opinion is disposed to take the view that a sharp spur, such, for instance, as would be provided by a positive improvement in European affairs, will be necessary to reawaken confidence.

General Electric Report

In declaring record profits and an increase from 15 per cent. to 17½ per cent. in the distribution on this year's increased ordinary capital the General Electric Company well satisfied expectation; the results failed, however, to infuse any enthusiasm into the market's present chastened mood. That the rate of expansion in profits should show some deceleration had been discounted in view of the rising level of costs and taxation. Allowing for deduction of the dividend, the price of the shares remains unaltered, at 78s. 6d. Earlier this year General Electrics were standing at nearly 95s. and were being talked up to £5. The relapse is due, of course, not to any special considerations, but to surrounding conditions and the investor's change of attitude towards industrial equities as a class. On the latest distribution the yield on General Electrics works out at a little less than 4½ per cent. Earnings, it is noted, covered payment of the dividend and bonus with sufficient in hand to make substantial additions to reserves; the impressive proportions of the latter lead some people to anticipate a scrip bonus being distributed sooner or later.

British Electric Traction

Proprietors of British Electric Traction deferred stock enjoyed at the company's annual meeting the unusual advantage of hearing their chairman's views on the value of their holdings, and on what should be done with their bonuses. On the first question, the answer appeared to be that the stock was well worth the then price of about 1,400, and perhaps a good deal more. The emphatic recommendation that the stock should be held was accompanied, stockholders will carefully note, by an assumption that bonuses will be retained as scrip and not sold. The latter course would, it was suggested, inevitably result in eventual loss of capital. The chairman was in more serious vein when discussing the position of the company's electricity supply undertakings. In roundly condemning the latest Government proposals, he had little hesitation in applying the word confiscation to the projected method of dealing with assets. In general, he added weight to the already considerable mass of opposition to the bureaucratic character of the scheme. The price of the deferred stock is now 1275, the equivalent of the last scrip bonus having been deducted since the date of the meeting.

North Atlantic Cable Rates

It may be recalled that some four years ago a Cable Conference was held in Madrid at which the decision was reached to revise cable rates in various cases. The North Atlantic rates were left unchanged. Notwithstanding this, on the Western Union, Commercial Cable and other North Atlantic communication routes charges were advanced. Protests were raised in London, and on the Continent, as a result. Committees were formed in London and in New York to agitate against the increases, but, for all that, the rates were put up to their present scale, which for Stock Exchange cabling purposes is 11d. per word for the urgent service and 5½d. for the ordinary service. These apply to code words only. A week or two ago, the Federal Communications Committee decided from New York that the urgent rate was discriminatory and that there was artificial delay on the handling of messages.

On the strength of this statement, it is expected in London that the rates will be re-arranged for the code words, and that messages will be cabled in rotation as they are handed in. This is claimed as a victory for the North Atlantic cable users. The companies, Western Union, Commercial and Cable and Wireless, work on uniform rates. The Federal Communication Board's ruling will come into full operation in December next.

Miscellaneous Matters

Rumours that the Government had decided to drop its scheme for re-organising the electricity supply industry were scotched promptly by the official denial. Feeling in the market for the shares concerned remains sanguine, nevertheless, that fundamental changes in the plan will have to be made. Share prices remain depressed, but the downward movement has been arrested. Changes during the past week have been negligible. The same can be said of electrical equipment issues, amongst which, however, Crompton Parkinsons recovered ½, to 57s. 6d. Transatlantic markets are dominated by the grave labour unrest; stock prices have moved downwards in many cases. The latest Cable and Wireless traffic index, which again made good reading, evoked a little interest; this, however, quickly evaporated, leaving prices of the stocks scarcely altered on balance. Iron and steel shares failed to sustain a rather half-hearted move towards recovery. The rubber market also tried to go better, but fell back on dullness in the New York price for the commodity.

Share List of Electrical Companies

	Dividend. Nom.	Previous.	Last.	Price. June 22.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	68/9	—	4 7 3
City of London	1	7½	7½	33/–	–6d.	4 11 0
Clyde Valley	1	7	8	39/–	—	4 2 1
County of London	1	10½	10½	46/6	–1/–	4 10 6
Edmundson's 7% Pref.	1	7	7	34/–xd.	–6d.	4 2 4
Do. Ord.	1	8	9	40/–	—	4 10 0
Elec. Dis. Yorkshire	1	9	9	42/6	–6d.	4 4 10
Elec. Fin. and Securities	1	12½	12½	2½	—	4 13 0
Elec. Supply Corporation	1	11	12	54/6	—	4 8 1
Lancs Light and Power	1	7½	7½	33/6	+6d.	4 9 7
Lond. Assoc. Electric	1	—	7	31/3	–9d.	4 9 6
London Electric	1	7	8	35/6	—	4 10 2
London Power Deb. Red.	Stock	5	5	106½	—	4 14 0
Metropolitan	1	10	10	45/–	–6d.	4 9 0
Midland Counties	1	7½	8	37/–	—	4 6 4
Mid. Elec. Power	1	8	9	2	—	4 10 0
North Eastern Electric Ordinary	1	6	7	31/6	—	4 9 0
Do. 7% Pref.	1	7	7	34/6	–6d.	4 1 2
Northampton	1	10	10	45/–	—	4 9 0
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	46/3	—	4 6 7
Do. do. 6% Pref.	1	6	6	31/–	—	3 17 5
Scottish Power	1	8	8	36/6	+6d.	4 7 6
South London	1	7	7	32/–	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	22/–	—	6 16 4
Yorkshire Elec.	1	8	8	40/6	—	3 19 0
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	114	—	4 7 9
Do. 1955–75	,,	5	5	115½	—	4 6 7
Do. 1951–73	,,	4½	4½	109	—	4 2 7
Do. 1963–93	,,	—	3½	97½	—	3 11 10
London Elec. Trans. Gtd.	,,	—	2½	91	—	2 15 0
London & Home Counties, 1955–75	,,	4½	4½	111	—	4 1 1
London Passenger Transport, A	,,	—	4½	116½	—	3 17 3
Do. do. B	,,	—	5	117½	—	4 5 1
Do. do. C	,,	4	4	81	–1	4 18 9
West Midlands Joint Elec. 1948–68	,,	—	5	111½	—	4 9 8
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	166½	—	5 8 1
Anglo-Am. Tel. Pref.	Stock	6	6	126	—	4 15 3
Do. Def.	,,	1½	1½	29½	—	5 1 8
Cable & Wireless 5½% Pref.	,,	4½	5½	111½	—	4 18 3
Do. A. 7½% Ord.	,,	Nil	Nil	24	–½	—
Do. B. Ord.	,,	Nil	Nil	6	—	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	15½	—	2 18 1
Do. do. Pref.	10	6	6	14	—	4 5 9
Great Northern Tel.	10	20	20	42	+½	4 15 5
Marconi-Marine	1	10	7½	1½	—	4 5 9
Oriental Telephone Ord.	1	12*	12*	3½	—	3 16 10
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	21½	+2	—
British Electric Traction Def. Ord.	,,	5	5	1275xb.	+6	—
Do. do. Pref. Ord.	,,	8	8	165	—	4 15
Brazil Traction	$100	40 cts.	50 cts.	23½	–½	—
Brit. Columbia Elec. Rly. Pcf.	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	—	—
Do. 1st Bonds	$500	5	5	44½	—	—
Victoria Falls Ord.	1	20	12	63/9xd.	—	3 18 0
West Riding	1	6½	10	45/–	—	4 9 0
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	2½xd.	–1/–	5 14 3
Assoc. Elec. Ord.	1	8	10	47/–	–6d.	4 5 2
Do. Pref.	1	8	8	37/6	—	4 5 3
Babcock & Wilcox	1	8	10	48/9	—	4 2 0
British Aluminium Ord.	1	7½	10	50/–	+9d.	4 0 0
British Insulated Ord.	Stock	20	20	4½	—	4 6 6
Brush Ord.	Stock	Nil	Nil	51½	—	—
Callender's	1	15	15	4½	—	3 4 0
Do. 6½% Pref.	1	6½	6½	30/–	—	4 6 8
Crompton Parkinson Ord.	5/–	12½	12½	57/6	+½	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	7	10	37/6xd.	+1/6	5 6 8
Enfield Cable Ord.	1	25	25	5½	—	4 9 0
English Electric	1	Nil	Nil	32/6	+6d.	—
Do. do. Pref.	1	6½	6½	26/–	—	5 8 4
Ericsson Tel.	5/–	20	25	2½	—	2 12 8
Ever Ready	5/–	35	45	32/6	+6d.	6 18 6
Ferranti Pref.	1	7	7	26/3xd.	—	5 2 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	15	17½	78/6xd.	—	4 9 2
Henley's	5/–	30	15	19/6	–6d.	3 17 0
Do. 4½% Pref.	1	4½	4½	1½	—	4 0 0
India-Rubber Pref.	1	5½	5½	22/6	—	4 17 9
Johnson & Phillips	1	7½	10	42/–	—	4 15 3
Lancashire Dynamo	1	10	20	3⅛	—	6 1 0
Siemens Ord.	1	6	7½	32/6	—	4 12 4
Telegraph Construction	£1	Nil	7½	2⅛	—	3 8 8

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken

1935

541. "Liquid break circuit-breakers." British Thomson-Houston Co., Ltd., H. Trencham and H. E. Cox. November 28th, 1935. (466427.)

23896. "Alternating-current commutator machines, particularly but not essentially alternating-current commutator motors." Naamlooze Vennootschap Machinerieen En Apparaten Fabrieken Meaf. September 1st, 1934. (466481.)

26367. "Switch-plug boxes." Stotz-Kontakt-Ges. September 21st, 1934. (Cognate applications 26368/35, 26369/35 and 26370/35.) (466205.)

29058. "Burglar, fire and like alarm arrangements for use in telephone systems." Electro-Gard Soc. Anon. October 20th, 1934. (Cognate application 29059/35.) (466348.)

29157. "Automatic voltage regulators." C. A. Parsons & Co., Ltd., H. B. Topham and V. Easton. October 22nd, 1935. (466208.)

29164. "Speed control of dynamo-electric machines." British Thomson-Houston Co., Ltd., and R. D. Given. October 22nd, 1935. (466349.)

31972. "Apparatus for electrically controlling feed or delivery of cotton or other fibrous material in preliminary opening machines." Tweedales & Smalley (1920), Ltd., and R. R. Dorling. November 19th, 1935. (466351.)

32258. "Generation of mechanical waves of supersonic frequency." Scophony, Ltd., and J. H. Jeffree. November 21st, 1935. (466212.)

32397. "Wireless signalling apparatus." J. Robinson. November 22nd, 1935. (466415.)

32471. "Electric signal transmission systems." A. D. Blumlein. November 22nd, 1935. (466418.)

32943. "Radio receivers for television and the like." Baird Television, Ltd., and L. R. Merdler. November 23rd, 1935. (466419.)

32694. "Remotely controlled recording apparatus." Telefonaktiebolaget L. M. Ericsson. November 28th, 1934. (466280.)

32703. "Electric switches of the tumbler type." Wandsworth Electrical Manufacturing Co., Ltd., and T. Batchelor. November 26th, 1935. (466213.)

32728. "Separators for electric storage batteries." J. Lucas, Ltd., and D. G. Spencer. November 26th, 1935. (466355.)

32899. "Electric discharge tubes." Baird Television, Ltd., and A. H. Johnson. November 27th, 1935. (466426.)

32912. "Apparatus for electrolytically decomposing water or other liquids under pressure." H. Olsen. November 28th, 1934. (466563.)

32940. "Electric or electro-magnetic wave-signalling apparatus." J. Robinson. November 27th, 1935. (466497.)

32999. "Railway-track circuit apparatus." Westinghouse Brake & Signal Co., Ltd. July 25th, 1935. (466500.)

33051. "Electric lamps comprising luminescent materials." General Electric Co., Ltd., and J. T. Randall. November 28th, 1935. (466503.)

33144. "Television." Radioakt-Ges. D. S. Loewe. December 1st, 1934. (Addition to 441761.) (466571.)

33145. "Method of and arrangement for transmitting television images." Radioakt-Ges. D. S. Loewe. December 1st, 1934. (466508.)

33260. "Electro-hydraulic power installations for the operation of movable bridges and the wedging gear." Sir W. Arrol & Co., Ltd., and J. M. Baxter. November 30th, 1935. (Cognate application 30242/36.) (466219.)

33265. "Circuit arrangements for producing grid potential for grid-controlled multi-phase electric-discharge devices." Siemens-Schuckertwerke Akt.-Ges. December 1st, 1934. (466282.)

33354. "Telephone transmitters, particularly suitable for forming part of hand-microtelephones." Siemens Bros. & Co., Ltd., and G. W. Sutton. December 2nd, 1935. (466584.)

33379. "Circuit arrangements for automatically timing operation of electric apparatus." F. Brailsford and Metropolitan-Vickers Electrical Co., Ltd. December 2nd, 1935. (466577.)

33503. "Permanent magnets and methods of manufacturing the same." British Thomson-Houston Co., Ltd. December 20th, 1934. (466586.)

33513. "Means for discharging electricity from materials and machinery." C. R. A. Chadfield. December 3rd, 1935. (466579.)

33623. "Permanent magnets and methods of making the same." British Thomson-Houston Co., Ltd. December 24th, 1934. (466587.)

33631. "Multiple-unit electric motor control systems." General Electric Co., Ltd., and E. H. Croft. December 4th, 1935. (466285.)

33685. "Spark-plugs." General Motors Corporation. December 7th, 1934. (466428.)

33693. "Electric water-heaters." Santon, Ltd., and H. C. Sanders. December 5th, 1935. (466518.)

34551. "Electric resistance elements or refractory supports therefor." Walsall Conduits, Ltd., W. Whalley and A. E. Read. December 13th, 1935. (466361.)

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1547. "Multi-electrode amplifier valves." E. K. Cole, Ltd., and G. Bradfield. January 17th, 1936. (466363.)

2306. "Electric fuses." W. T. Henley's Telegraph Works Co., Ltd., and H. C. Hoban. January 24th, 1936. (466525.)

2824. "Inductance coils." H. W. Sullivan, Ltd., and W. H. F. Griffiths. January 30th, 1936. (466364.)

2912. "Radio circuits employing reaction." E. K. Cole, Ltd., and G. Bradfield. January 31st, 1936. (466526.)

6232. "Telephone impulse transmitters." General Electric Co., Ltd., and C. C. Puckette. March 2nd, 1936. (466301.)

6387. "Street-lamp structures." J. Keith & Blackman Co., Ltd., and G. Keith. March 7th, 1936. (466367.)

8034. "Electrical systems of remote control." General Electric Co., Ltd., G. Allsop and N. C. Smart. March 17th, 1936. (466369.)

8405. "Insulated electric conductors." Okonite Co. March 26th, 1935. (466304.)

8599. "Fabricated magnet frames for dynamo-electric machines." English Electric Co., Ltd., and E. H. H. Hassler. March 23rd, 1936. (466532.)

9519. "Electrically heated pressing-irons." R. Mason. March 31st, 1936. (466533.)

11399. "Method of and means for protecting halogenous dielectrics from deterioration." British Thomson-Houston Co., Ltd. (Compagnie Francaise pour l'Exploitation des Procédés Thomson-Houston.) April 21st, 1936. (466376.)

21625. "Electric cables, particularly, although not essentially, high-frequency electric cables." Siemens & Halske Akt.-Ges. August 6th, 1935. (466385.)

22459. "Telegraphic transmitting apparatus." Standard Telephones & Cables, Ltd. September 4th, 1935. (Cognate application 22460/36.) (466456.)

22468. "Electric condensers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 17th, 1935. (466542.)

22614. "Lamp fittings." Komor Henrik-Fele Fenytechnika Villamossagi Es Muszaki Vallalat k.f.t. August 19th, 1935. (466240.)

22661. "Navigation-aiding radio receiving apparatus." August 16th, 1935. (466241.)

23115. "Electric condensers." British Thomson-Houston Co., Ltd. August 23rd, 1935. (466388.)

23800. "Electric relay apparatus." British Thomson-Houston Co., Ltd. August 30th, 1935. (466392.)

24433. "Watt-hour meters." Westinghouse Electric & Manufacturing Co. October 24th, 1935. (466544.)

24532. "Electro-magnetically operated relays, axle counters, key-locking devices, and like apparatus." Vereinigte Eisenbahn-Signalwerke Ges. September 16th, 1935. (466323.)

26072. "Synchronisation of saw-tooth generators, especially for television purposes." E. Michaelis. September 25th, 1935. (466396.)

26073. "Valve detector circuits for television receivers." E. Michaelis. September 26th, 1935. (466545.)

27033. "Modulated carrier-wave transmitters." Marconi's Wireless Telegraph Co., Ltd. October 5th, 1935. (466546.)

27053. "Electrical signalling systems." Electrical Research Products Inc. October 30th, 1935. (466327.)

28079. "Electric reflector lamps." Elektrotechnische Fabrik Schmidt & Co. Ges. October 17th, 1935. (466464.)

28151. "Coupling systems for high-frequency electric circuits." Hazeltine Corporation. November 19th, 1935. (466250.)

28542. "Electric cut-outs." British Thomson-Houston Co., Ltd. October 24th, 1935. (466251.)

29759. "Electric cooking stoves." A. Flury and W. Brunold. November 2nd, 1936. (466547.)

29772. "Electric-discharge devices." British Thomson-Houston Co., Ltd. November 1st, 1935. (466254.)

31313/4. "Mercury and like conducting-liquid electric switches." British Thomson-Houston Co., Ltd. November 15th, 1935. (466257/8.)

35121. "Electric valve amplifying systems." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. December 23rd, 1935. (466404.)

35739. "High-tension electric switches." British Thomson-Houston Co., Ltd. December 30th, 1935. (466553.)

35761. "Dial switch for use in telephone or like systems adapted to render particular call numbers inoperative." Telephon-Apparat-Fabrik E. Zwietusch & Co. Ges. February 5th, 1936. (466338.)

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3027. "Containers for galvanic batteries." Chloride Electrical Storage Co., Ltd. May 18th, 1936. (466556.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from June 16th:—

Tiny-Tim. No. 573523. Class 6. Portable combinations of internal-combustion engines with electric generators, electric generators and motors.—Continental Motors Corporation, Detroit, Mich., U.S.A. (British representatives: Frank B. Dehn & Co., Kingsway House, 103, Kingsway, W.C.2.)

Cascader, Magnetic Separators, Ltd., Liverpool, England (lettering and design). No. 574745. Class 6. Magnetic separating machines.—Magnetic Separators, Ltd., 2-4, Grimshaw Street, Bootle, Liverpool.

Maxade. No. 574573. Class 11. Instruments, apparatus and contrivances (not medicated) for surgical or curative purposes or in relation to the health of men or animals.—Peto Scott Co., Ltd., 77, City Road, E.C.1.

Tunion. No. 574421. Class 13. Electrical fittings, smoothing irons, saucepans, &c., all made of ordinary metal.—George Turncock, Ltd., Tunion Works, 41, High Street, Aston, Birmingham.

Nonflammite. No. 577092. Class 40. Goods manufactured from india-rubber or gutta-percha. Durham Cables, Ltd., Birtley, County Durham.

Electricity and Horology

Two of the subjects to be dealt with at this summer's meeting of the Journées Internationales de Chronométrie et de Métrologie will be concerned with frequency control of electrical transmission systems and metrology. The meeting is to be held in Paris from July 6th to 11th. Further particulars may be obtained from the secretary, 29, Rue de Berri, Paris, 8.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeenshire.—School, New Byth; architect, County Council, Aberdeen.

Aberystwyth.—Buildings, adjoining Penglais Road, for the University College of Wales; P. Thomas, architect, 10, Cathedral Road, Cardiff.

Ashton-in-Makerfield.—Houses (82), near Warrington Road; U.D.C. surveyor.

Aylesbury.—Alterations and additions to electricity works, Exchange Street; borough surveyor.

Bacup.—Electricity offices and showrooms, St. James Square; A. Brocklehurst, architect, St. James Chambers, Waterfoot.

Bedlington.—Houses, Netherton Road; U.D.C. surveyor.

Birmingham.—Factory, Charlotte Street, for Elkington & Co., Ltd., Newhall Street; Sapcote & Sons, builders, Camden Street. Flats (271), Emily Street, for C.C. (£200,000), with electrical work; H. G. Dyke, builders, 14, Langham Place, London, W.1. Technical college, Corporation Street, for E.C.; H. V. Ashley and Winton Newman, 14, Gray's Inn Square, London, W.C.1.

Bishop Auckland.—Rebuilding of the Auckland Cottage Hospital (£20,000); Adams, Holden and Pearson, architects, 9, Knightsbridge, London, S.W.1.

Blackpool.—Additions to works, Stanley Road, for the Proprietors of the *West Lancashire Evening Gazette* and *Blackpool Gazette and Herald*, Victoria Street; Halstead Best, architect, Leeds Buildings, 20, Clifton Street.

Bolton.—Houses (24), Wisbech Road; J. Staton, Ltd.

Bournemouth.—Buffet and pavilion (£15,000); borough engineer. Extensions to St. Luke's school; managers.

Brighton.—Flats (59), Nelson Place (£32,760); Rice & Son, Ltd. Mental institution buildings, Laughton Lodge (£33,000); G. Bainbridge & Son, Ltd.

Brownhills.—Houses (200) (£62,370); U.D.C. surveyor.

Cannock.—Cinema and shops (£30,000), Manor estate, for M. Dent, Westbourne Road, Birmingham; Sir John Brown & Henson, architects, Northampton.

Cardiff.—Factory, Pengam, for the Machine Products, Ltd. Stores building, Velindre Road, Whitchurch, for E.C.; electrical engineer, 20, Park Place, Cardiff.

Chard.—Houses (48); W. Potter & Sons, builders, Watcombe House, Taunton.

Coventry.—Houses (168), Mercer Avenue, Stoke Heath; Eadie, Towers & Co., builders, Wolverhampton. Block of shops with offices and flats, Fleet Street, for Hillier, Parker, May & Rowden, 27, Maddox Street, London, W.1; Wm. Moss & Sons, builders, Loughborough. Science block (£15,000), to the Bablake College; Building & Public Works Construction Co., Ltd., builders, Swindon.

Darton (YORKSHIRE).—Houses (56), New Road, Staincross (£50,634); Royston Builders, Ltd., North Road, Royston.

Doncaster.—Houses (20), near Sunnymede Terrace, Askern; R.D.C. surveyor. Additions to the grammar school (£50,000) with electrical work; J. L. Leathart, architect, 39, Gordon Square, London, W.C.1.

Dukinfield.—Premises, King Street, for the Ashton Co-operative Society.

Dundalk.—Houses (30), Laurels Demesne; J. McGuinnes, builder.

Eastry.—Council offices, Poplar Meadow, Sandwich; H. M. Barker, architect, 16, King Street, Deal.

Eccles.—Houses, Winton (36½ acres); T. Elce, borough surveyor. Additions to Vulcan works, Patricroft, for Mitchel, Shackleton & Co., Ltd.; E. B. Jones & Rawlinson, Ltd., builders, Salford.

Edinburgh.—Cinema, Lothian House, Lothian Road, for the Associated British Cinemas, Ltd.; S. Kaye, architect, 14, Hill Street.

Erdington.—Fire station buildings; Nichol, Nichol & Thomas, architects, 111, New Street, Birmingham.

Exeter.—Maternity hospital, Polsloe Road, and school, Whipton; city architect.

Exmouth.—Extensions to Duncroft Hotel (£15,000); A. E. Eveleigh, builder, Richmond Road, Exeter.

Farnborough (HAMPSHIRE).—Houses (48), Knellwood estate; U.D.C. surveyor.

Folkestone.—Houses (26), Risborough Lane, Cheriton; E. L. Allman, borough engineer.

Fowey.—Houses (24), Polvillion Road; C. W. Parkes, Lees & Son, architects, 27, Fore Street.

Glasgow.—Conversion of buildings, for the Royal Infirmary, into out-patients' department (X-ray and electrical sections), £60,000; J. Miller, architect, 15, Blythswood Square.

Gravesend.—Child welfare centre, King's Farm estate; borough architect, 5, Woodville Terrace.

Hanworth.—Cinema, Hampton Road; Fassnidge, Son & Norris, Ltd., builders, Uxbridge.

Harpenden.—Houses (60), Westfield estate; U.D.C. surveyor.

Hastings.—Houses (52), Broomgrove; borough surveyor.

High Wycombe.—Houses (52), Bowerdean Valley estate; Colborne's Estates, Ltd. Shops and flats, Rutland Avenue; White Bros.

Hornchurch.—Shops and dwellings, Elm Park Avenue and the Broadway, Elm Park; Edis Estates, Ltd.

Horsforth.—Houses (99), South Broadgate Lane site; J. E. Aldersley, architect, Council Offices.

Hull.—Houses for the aged, Bilton Grange estate; city architect.

Hyde.—Houses (118), Walker estate; borough engineer. Extensions to works, Schofield Street; Aveyard Bros., Ltd.

Irish Free State.—(GALWAY).—Houses (41); borough surveyor, Francis Street.

Isleworth.—Houses (80), Nazareth estate; J. G. Carey, borough surveyor, Council House, Hounslow.

Kendal.—Houses (32), Buttery Well Road; G. German, borough surveyor.

Leeds.—Barclays Bank (five storeys), The Headrow (£45,000), with electrical work; J. T. Wright & Son, Ltd., builders, Leeds.

Liverpool.—Houses and flats, Woodfall Heath estate; Middleton & Co., builders, Blackpool.

Llanelly.—Houses (54), Morfa; H. Thomas & Co., builders, Llanelly.

London.—(LAMBETH).—Houses, small areas (£32,300); L.C.C. architect, County Hall, Westminster Bridge, S.E.1. (LEWISHAM).—Factory, Thurston Road; Griggs & Son, Ltd., 10, Victoria Street, S.W.1. Flats, Southend Lane, and houses, Moremead Road; T. Spencer Bright & Co., 1, New Court, W.C.2. (POPLAR).—Tenements (109), Perring estate (£49,628); A. E. Symes, Ltd., 1a, Carpenters Road, E.15. (WOOLWICH).—Flats (420), Barnfield Road (£263,000); L.C.C. architect, County Hall, Westminster Bridge, S.E.1. (E.2).—Extensions to Queen's Hospital for Children, Hackney Road (£40,000); E. H. Burgess, Ltd, builders, Brentford. (FINSBURY).—Central health centre (£39,184); borough engineer, Town Hall, E.C.1. (GREENWICH).—Dwellings (95), Eastney Street area (£60,370); L.C.C. architect, County Hall, Westminster Bridge, S.E.1.

Maghull.—Cinema, for Alt Park Estate, Ltd.

Manchester.—Cinema, Radnor Street, Hulme (£25,000), including nursery; A. Murray, Bury. Printing works, Harper Road, Northenden; W. Thorpe & Sons, Ltd., builders, Cornbrook.

Middlesbrough.—Houses, Hutton Road South, for W. H. Causier; H. Moore, architect, 61, Albert Road. Offices, Cargo Fleet Road, for the Teesside Bridge and Enginering Co., Ltd.; Archibald and Archibald, architects, 26, Albert Road.

Midlothian.—Reconstruction and extension, Gorebridge school (£31,990), for E.C.

Newark.—Houses (24), North Clifton, Farndon and Belderton; R. Oakden, R.D.C. surveyor.

Newburn-on-Tyne.—Houses, West Denton Main Road estate; Stephenson and Gillis, architects, 2, Saville Place, Newcastle-on-Tyne. Fire station; U.D.C. surveyor.

Newcastle-on-Tyne.—Houses, Coulson Road area and Palmer Street; F. M. Dryden, architect, 6, Market Street. Houses (299) and bungalows, Blakelaw estate, and extensions to the General Hospital, for C.C. (£272,000); city architect, 18, Cloth Market. Rebuilding of premises, Blackett Street, for Fenwick and Co.; Mauchlen and Weightman, architects, Saville Row.

Newport.—Extensions to the Royal Gwent Hospital (£32,000); secretary, Royal Gwent Hospital.

Northleach (GLOUCESTERSHIRE).—Houses (20); R.D.C. surveyor.

Northumberland.—School, Belford, for C.C. (£15,000); county architect, County Hall, Newcastle-on-Tyne. Schools, Bedlington (£23,100), and Morpeth (£29,000), for County E.C.

Northwich.—Houses, Allostock, Utkinton, Rushton and Tarporley; J. Birtwistle, R.D.C. surveyor, Whitehall, Hartford, Cheshire.

Nottingham.—Houses (1,550), for the Housing Committee, city slum clearance scheme (£659,945); housing architect, Guildhall.

Oxford.—Infectious diseases hospital and staff quarters, Headington (£77,300); Benfield & Loxley, Ltd., builders, Oxford.

Paisley.—Maternity hospital, Hawkhead; burgh surveyor.

Preston.—Extensions to Moss Side Hospital, Kirkham (£27,000), for the Flyde Joint Hospital Committee; H. Joyce & Sons, builders, St. Annes-on-Sea.

Richmond (YORKSHIRE).—Houses (56); G. Shaw, builder.

Rochester.—Houses (49), Darnley Road site; city surveyor. Guildhall.

St. Helens.—General offices and garage, Hall Street, for the Transport Committee; A. P. Statham, borough engineer, Town Hall. Wing to the nurses' home (£15,000), for the Board of Management, Providence Free Hospital; W. Ellis, architect, Union Bank Buildings, Hardshaw Street.

Scunthorpe.—Houses (66), Crosby estate; W. Farrar, borough surveyor.

Sea Houses (NORTHUMBERLAND).—Hotel, King Street; G. Reavell, architect, Lloyds Bank Chambers, Alnwick.

Skipton.—Houses (54) and bungalows, for aged persons; K. B. Robinson, U.D.C. surveyor.

Smethwick.—Houses (152), Perry Hill estate; R. Fletcher, borough engineer and surveyor, Council House.

Somerset.—School, Stoke-under-Ham, for E.C.; county architect, Taunton.

Stockport.—Houses (296), Lower Park estate, Chester Road, Poyton; A. Beswick (Builders), Ltd., Chester Road, Poyton. Cinema, Hazel Grove; Clifford Ogle, builder, Woodbank Park estate, Offerton.

Thorne.—School, South End (£18,500), for E.C.; A. Gregory & Son, builders, Castleford.

Todmorden.—Houses (28), Walsden; borough surveyor.

Warwickshire.—Schools, Bedworth and Polesworth; county architect.

Wellingborough.—Extensions to factory, for W. W. Chamberlain & Sons, Wood Street, Higham Ferrers.

Weymouth.—Houses (27), near Dorchester Road; G. A. Bloom & Son. Business premises, St. Thomas Street; Hawkes Freeman, Ltd. Ten-storey flats, clearance area; Biffen & Biffen.

Wisbech.—Houses (138); S. Matthew, borough surveyor.

Wolverhampton.—Addition to the Boulton and Paul Aircraft factory, Pendeford (£150,000); Wilson Lovatt & Sons, builders, Clarence Road, Wolverhampton.

Worksop.—Houses, Lincoln Street and Manton areas; C. O. Allsopp, borough surveyor. Houses (288) and roads, Raines Avenue estate, for F. Flint, Raines Avenue. Houses (22) and street, near Carlton Road, for G. Bowles & Sons, 107, Gateford Road.

Yorkshire.—School, Warwick Road, Redcar, for North Riding E.C.

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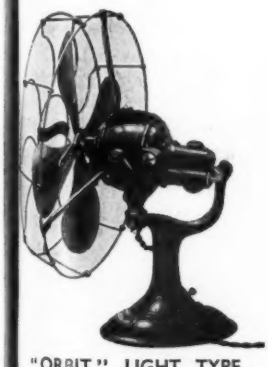
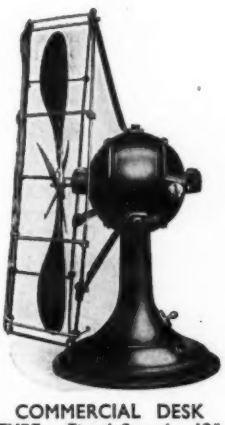
for all purposes

JUNIOR TYPE. 12" and 16" Blades. Three Speeds. DESK AND BRACKET.

"ORBIT" JUNIOR OSCILLATING FAN. Three Speeds. 12" Blades. DESK and BRACKET.



"ORBIT" LIGHT TYPE OSCILLATING FAN. Fixed Speed. 12" Blades.



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Commercial and Domestic and Bracket Fans. Oscillating and fixed types.

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V116

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18 Gns. *or* **5/-** *weekly.*
Separately . **14 Gns.** *and* **4 Gns.**

The Vactric "Silent Q," an inside-bag model for the larger home.
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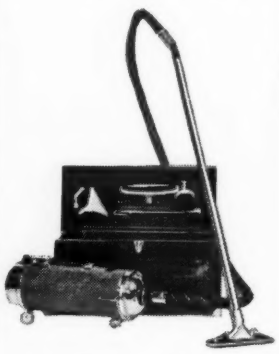

The Vactric "Junior," an outstanding cleaner at a moderate price, complete with full set of dusting tools.
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Every inch of shelf space usable. Extra large freezing chamber provides more ice . . . reduces running costs. A large tray for ice cream storage. 15 freezing speeds. Interior lighting.

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Operation performed by knee control whilst seated . . . . Even distribution of pressure. Apex-Vactric irons everything—ruffles, pleats, shirts, etc. Automatic thermostat controls heat. Prices range from **£20** to **£35.**

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The exclusive Apex Vactric "Double-Dasher" washes as gently as your own hands—dainty silks or the whole family wash. Incorporates the latest Lovell wringer with pressure indicator. The "Spin-Dry" model actually wash, rinse, blue, sterilise and dry for the line. Prices range from **£19 10s.** to **£55.**

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Temporary Address : CLIFTON HOUSE, EUSTON RD., LONDON, N.W. Showrooms : 149, Regent St., London, W.

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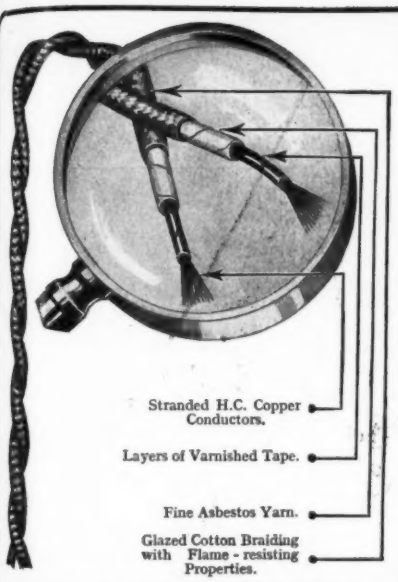
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Layers of Varnished Tape.
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Glazed Cotton Braiding with Flame-resisting Properties.

"GOLTONE" VARNOFLEX FLEXIBLE FOR USE WITH GAS FILLED LAMPS AND FITTINGS.

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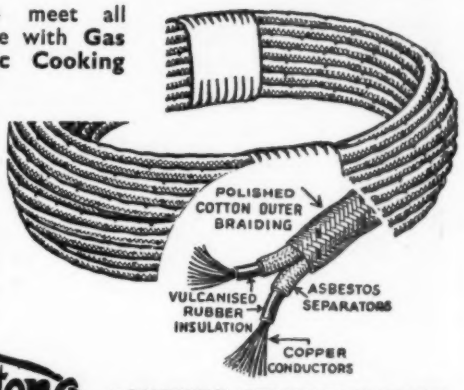
MANUFACTURED to meet all requirements for use with **Gas Filled Lamps, Electric Cooking Appliances,** and under all conditions where an asbestos heat-resisting conductor is essential.

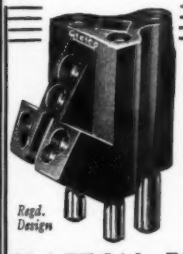
Prices and full particulars with Samples sent on request.

For wide range of "Goltone" Cables, Flexible, and Insulated Conductors, see catalogue "W," sent on request.



"GOLTONE" FERAFLEX FLEXIBLE CORD WITH ASBESTOS SEPARATORS.

Ward & Goldstone PENDLETON. MANCHESTER LTD.



3-PIN MULTI PLUG
COMBINED 15 amp. and 5 amp.

Grelco

FULL RANGE COMPRISES:

2 amp., 2-pin, 1/1½		2 amp., 3-pin, 2/-	
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Solid, made of brass and bakelite (no stampings). Specially suitable for switch sockets closely mounted to wall.

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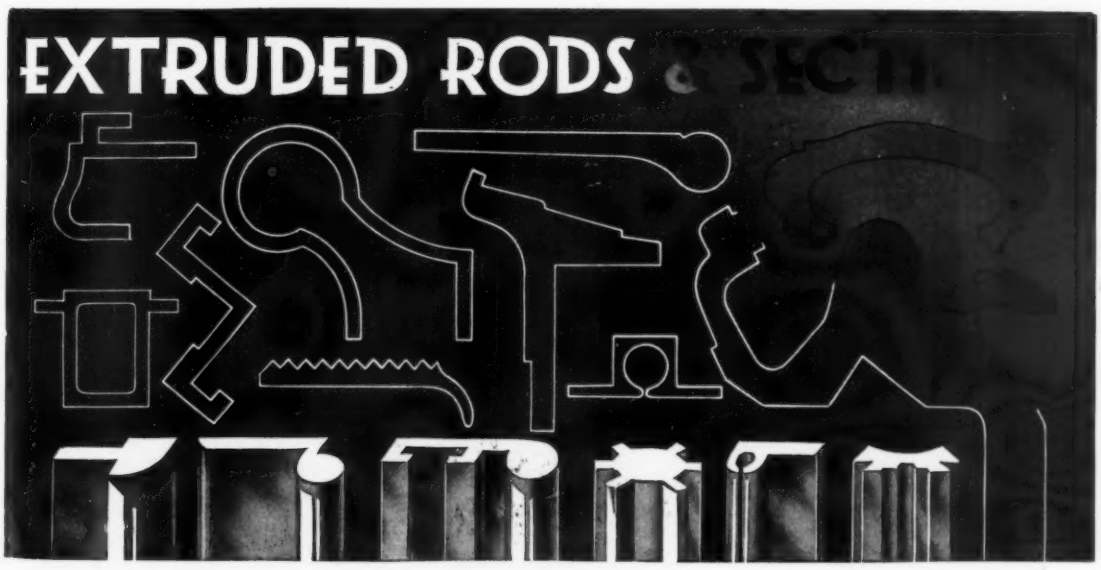

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Good lighting can paint pictures on the stage — can make a show stand out by emphasizing its every mood, joyous or sad. The Cryselco range covers all lamp needs.

Cryselco Lamps

CRYSELCO LTD., KEMPSTON WORKS, BEDFORD
AND HOME BRANCHES

A Super Enamelled wire.

Every Coil is perfect when Connolly's wire is used.

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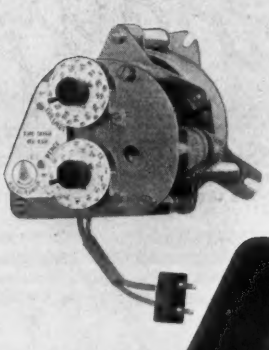
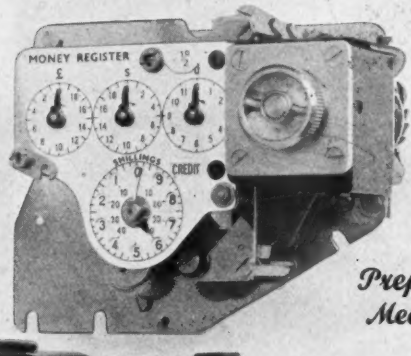
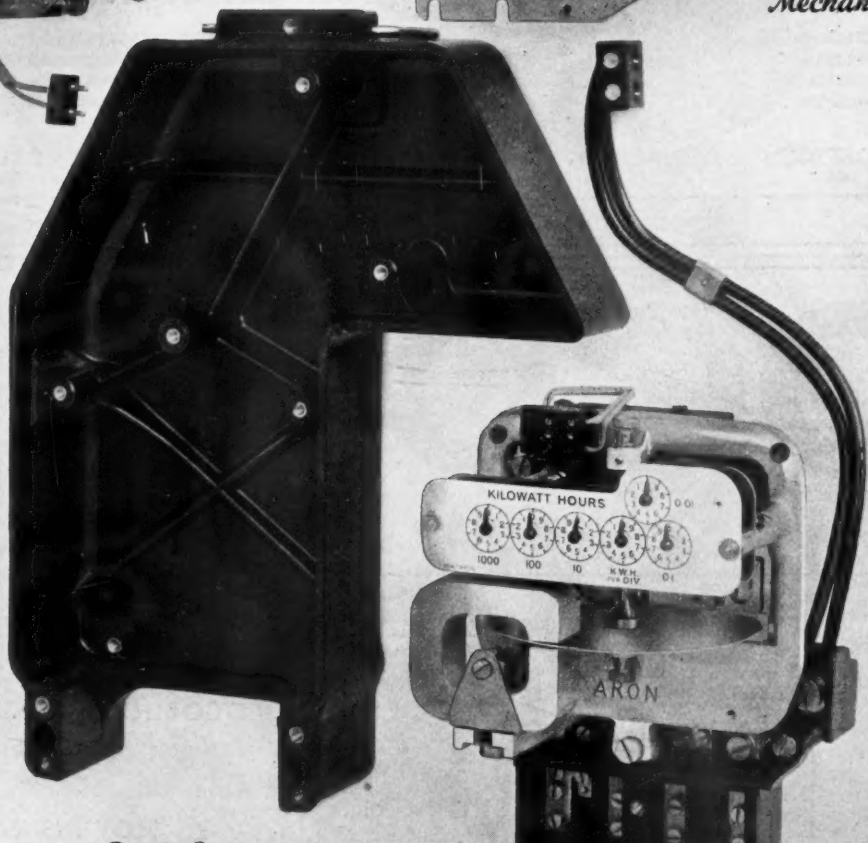
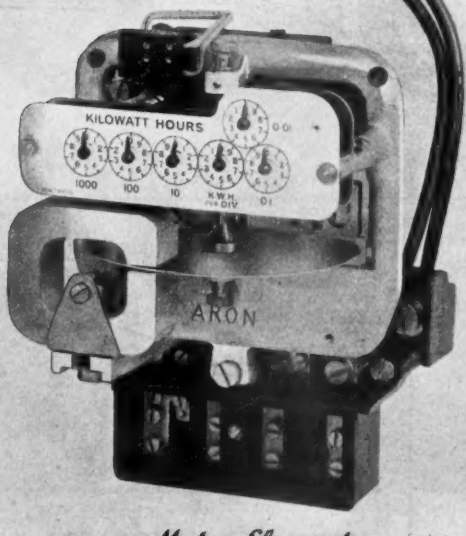




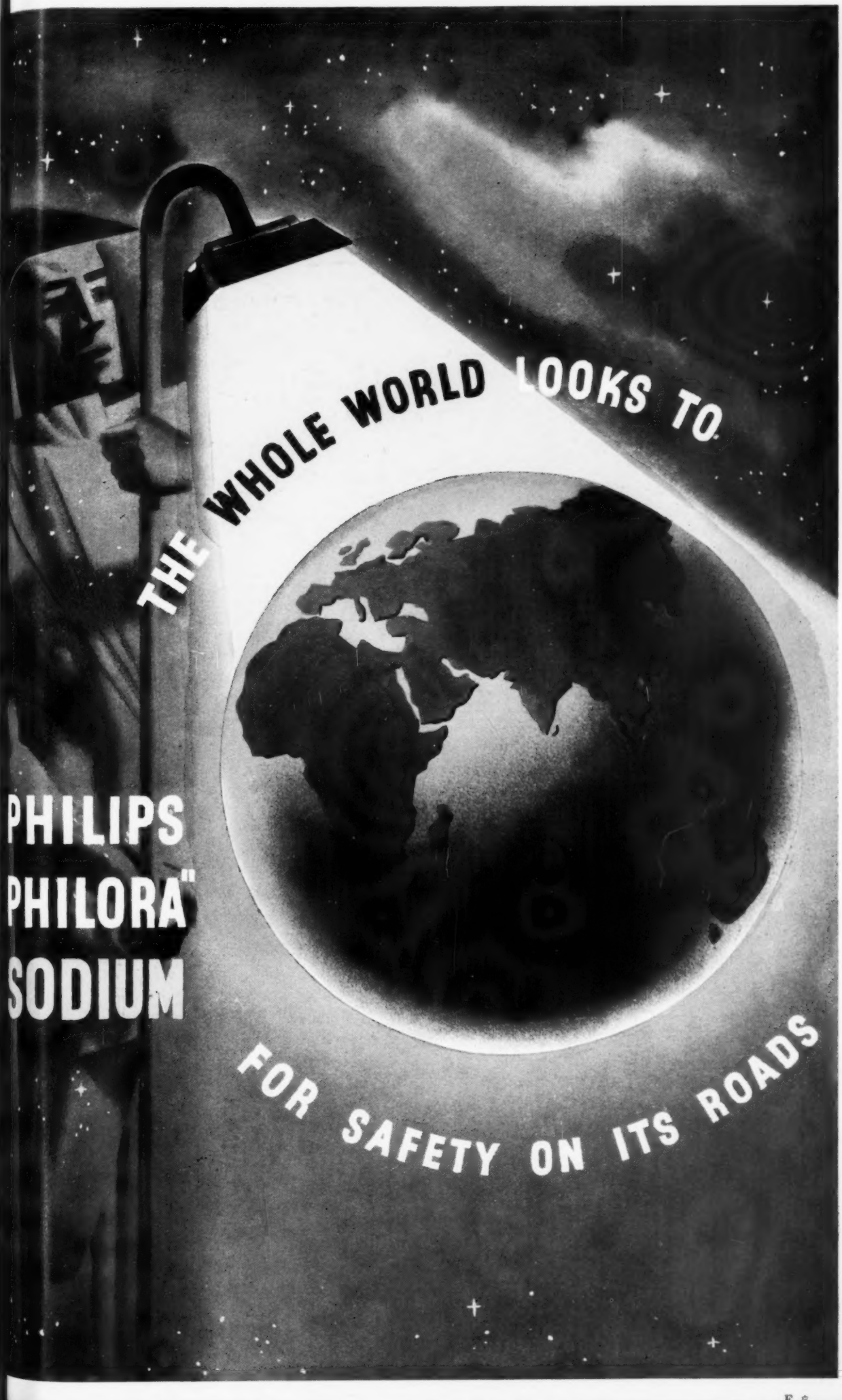
Prepayment Mechanism

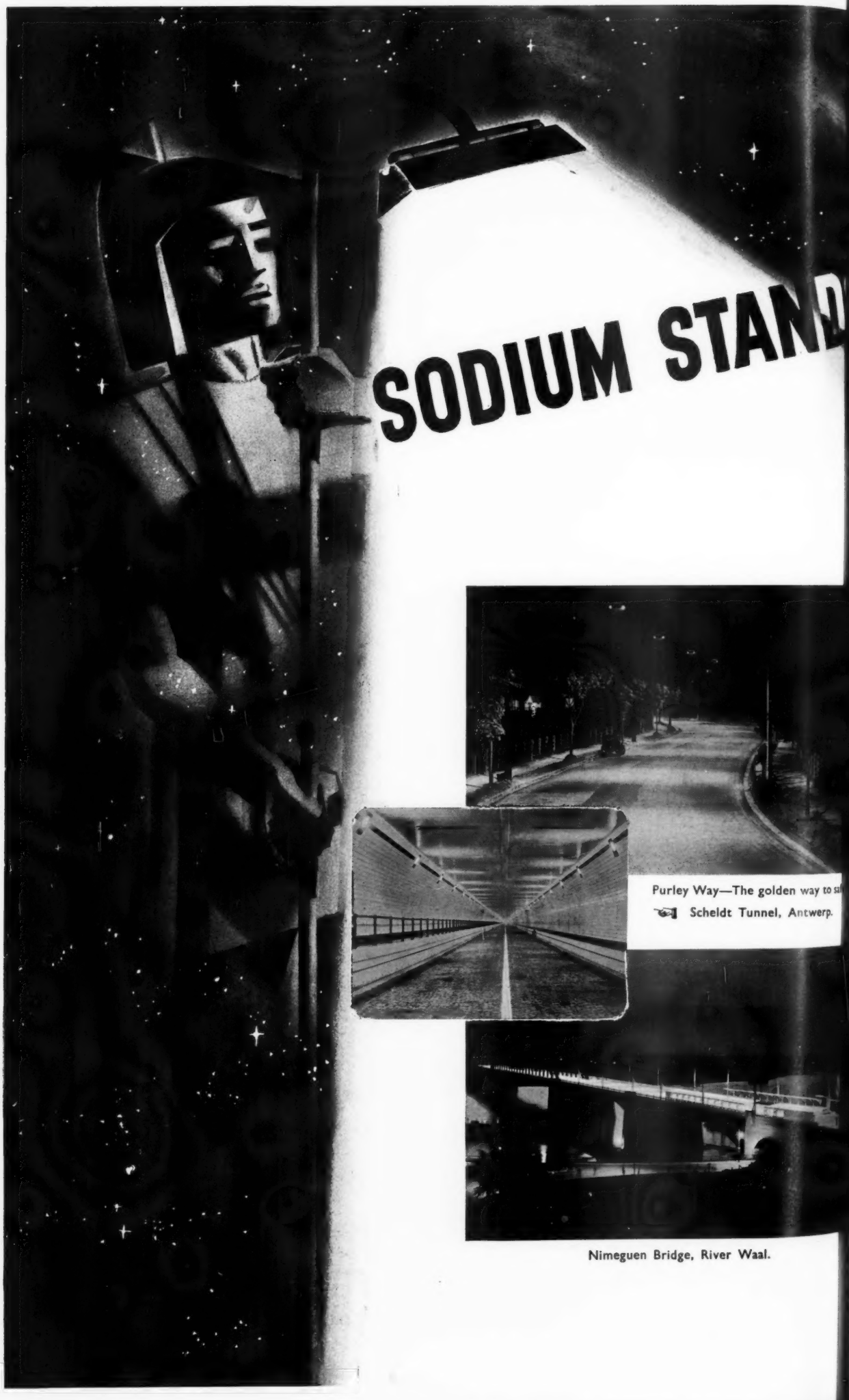


Back Casing



Meter Element


THE WHOLE WORLD LOOKS TO
PHILIPS
PHILORA"
SODIUM
FOR SAFETY ON ITS ROADS



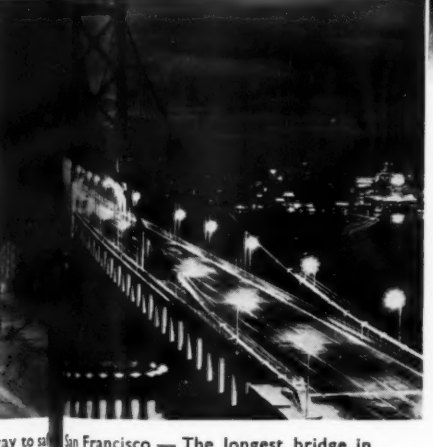
Purley Way—The golden way to sa

Scheldt Tunnel, Antwerp.

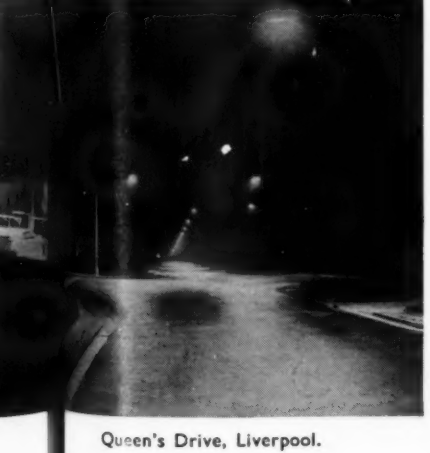
Nimeguen Bridge, River Waal.

SENTINEL FOR SAFETY

Every sodium-lit road in Britain is a Philips "Philora" installation. This soft, golden light, created and perfected by Philips, has brought night-time safety to hundreds of miles of British highways. Not only in Britain and the Empire, but also on the Continent and in America —the mileage of roads under sodium lighting is increasing every day. The principal reason for the growing use of "Philora" Sodium road lighting is the extraordinary visibility obtained. A sodium-lit road is an unbroken avenue of soft, golden light, absolutely free from glare and blackspots. No headlights are needed with sodium lighting. Objects on the road can be seen in pin-point detail at immense distances. Safe daylight speeds can be maintained under "Philora" Sodium at night.



San Francisco — The longest bridge in the world, lit by sodium.



Queen's Drive, Liverpool.

SODIUM FOR ECONOMY

A "Philora" Sodium lamp gives as much as five times more light than an ordinary lamp of equivalent wattage, and has a guaranteed life of 2,500 hours. So that on economic grounds also, sodium lighting has everything in its favour.

SODIUM IN INDUSTRY

Many branches of industry are finding in "Philora" Sodium the solution to their lighting problems. Sodium lighting means lower 'overheads' and increased production—both in quantity and quality, whilst workers like it because of its softness and freedom from glare.

PHILIPS "PHILORA" *Sodium* LIGHTING

IT WAS 5 YEARS AGO . . .

In December 1932 the first sodium discharge installation to light a British road was switched on at the Purley Way, Croydon. The arrival of "Philora" Sodium on this now famous road marked the opening of a new era of safer highway lighting. For the Philips scientists who made it possible, it was a milestone in progress. And still the work goes on.

The new 80 watt and 125 watt "Philora" mercury lamps were created in the Philips Laboratories and, over a wide range of uses, these new lamps are effecting important changes in lighting technique. They are particularly suitable for workshops and factories, for certain types of street lighting and for small floodlighting schemes.

Used in conjunction with incandescent filament lamps, the resultant blend of light is pure white, and therefore very suitable for shop window and other illumination.

PHILIPS
"PHILORA"
80 w. & 125 w.
MERCURY
LAMPS

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AUTO-CIRCULATORS

For fitting to many types of existing cylinders and tanks, Berry's Auto-Circulator has outstanding advantages over the ordinary immersion heater.

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- Minimum furring
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INDUSTRIAL DEVICES

THE "VARIAC" VOLTAGE CONTROL

Type 200-CUH Type 200-CMH

ONE OF VERY MANY G.R.—LYONS PRODUCTS

The " Variac," as its name implies, is a special transformer which has the smooth and uninterrupted control of a rheostat. But, more than any rheostat or potentiometer, the " Variac," when operated from an A.C. line, can give any voltage from zero to above the line voltage, thus making it suitable for restoring low-voltage lines to normal, or providing a means of giving over-voltage on occasions as required. The " Variac " is a toroidal auto-transformer in which the output voltage adjustment is obtained by sliding a carbon brush over the winding. The potential difference between turns is so small that the voltage changes smoothly and continuously as the knob is turned. Also, since the " Variac " is an auto-transformer, maximum loss for any given output current occurs at one-half the line voltage. At full-line voltage, there is no transformer action, and the current passes directly from the line through the brush to the load ; consequently the output current at full-line voltage can be 150 per cent. of the rated value.

Some of the more obvious uses of the " Variac " comprise :

1. Voltage control on rectifier systems.

2. Under- and over-voltage tests.

3. Restoring long lines, where voltage has dropped below normal to the correct value.

4. Meter calibration, by comparison with a standard, of A.C. voltmeters and ammeters.

5. Motor speed control : the " Variac " is a most convenient means of adjusting speed on small motors which are sensitive to voltage variations.

6. Theatre lighting control : the " Variac " is ideal for this purpose.

7. Soldering iron control. It provides economical maintenance of a proper operating temperature. Also a cold iron can be heated very rapidly by applying over-voltage until hot.

8. Photoflood lamps : photographers use the " Variac " to reduce brilliancy during preliminary adjustments and to lengthen the life of these expensive lamps. A slight over-voltage at the moment of exposure makes for brighter negatives and is apparently not detrimental to these lamps.

9. Transformer testing : " Variac " control in transformer primary circuits eliminates the third harmonic component of output voltage that is present when magnetising current flows in a resistive load.

Seven stock models are offered as indicated in the table below. Numerous other models are built to special order.

Type	Load rating	Primary voltage	Current (A.) Rated	Current (A.) Maximum	Output voltage	Net weight	Net Price
100 K	2 kVA.	115	15	17.5	0–115	20·5 lbs.	£12 10 0
100 L	2	230	8	9	0–230	24·00 ,,	£12 10 0
100 L		115	4	9	0–230	24·00 ,,	£12 10 0
200 B	170 V.A.	115	1	1·5	0–135	3·75 ,,	£3 5 0
200 CM	850	115	5	7·5	0–135	10·00 ,,	£5 10 0
200 CU	850	115	5	7·5	0–135	9·00 ,,	£4 15 0
200 CMH	580	230	1·5	2·5	0–270	10·00 ,,	£6 15 0
200 CMH		115	0·5	2·5	0–270	10·00 ,,	£6 15 0
200 CUH	580	230	1·5	2·5	0–270	9·00 ,,	£5 17 6
200 CUH		115	0·5	2·5	0–270	9·00 ,,	£5 17 6

For further details see Pages 8–10, Industrial Devices Section, Catalogue " J " (September, 1936), or request our special Engineering Supplement No. E-737.

Thousands of VARIAC CONTROLS are in use in the United Kingdom. Our regular customers include such World-famous names as : B.T.-H.: BAIRD TELEVISION : EKCO : GENERAL ELECTRIC : " H.M.V." : MITCHAM WORKS LTD. : MULLARD RADIO VALVE CO. LTD. : MURPHY RADIO : REYROLLE : STANDARD TELEPHONES : " T.C.C.," etc., etc. They have been adopted and purchased in large numbers by THE AIR MINISTRY, ADMIRALTY, G.P.O., WAR OFFICE, etc., and not a single VARIAC has ever been rejected.

We offer a practically complete range of LABORATORY APPARATUS especially designed for Research Engineers in the Electrical, Radio, Power Supply, Communications and Cables, Acoustical, Physical and Allied Fields. Also special apparatus for Industrial purposes such as : Fixed and Variable Standards of Capacity, Inductance and Resistance : Attenuation Networks : Decade-Potentiometer : Frequency and Time-Measuring Equipment : Oscillators of all types : Amplifiers : Broadcast Monitoring Equipment : Precision Wavemeters: Standard-Signal Generators : Bridges of every type : Megohm-Meters : Oscillographs and Cameras : Apparatus for Wave-form analysis : Wave-Filters : Output-Power Meters : Voltmeters and Ammeters of all patterns : Power-Level Indicators : Vacuum-Tube Devices of all types : Parts and Accessories, etc. Enquiries are cordially invited and will receive our immediate attention. Manufacturers' problems solicited.

PLEASE REQUEST OUR 176-PAGE ILLUSTRATED CATALOGUE 37-J.

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Head Offices: 76, OLDHALL STREET, LIVERPOOL, 3

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2,000,000 volt "Artificial Lightning" Flash

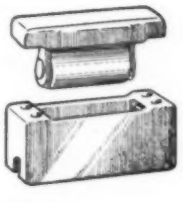
Photo: Keystone View Co.

Destruction

Lightning over London

Photo: Topical Press Ltd.

When all is dark; when thunder shakes the whispering leaf and lightning makes its wound across the sky, then is the hour of peril. Each mouse to its hole, each bird to its secluded nest retires, for nature's power brings Destruction as well as the blessings of strength. "Fear no more the lightning flash," sang the poet. But he sang thus only over the dead Imogen. Death was man's only escape from these anxieties . . . To-day, of his own accord he creates the stuff of which lightning is made, handling it with the ease of the potter his clay. He turns it into light and into heat: he uses it to drive his machines. And should, for but a fraction of a second, this enormous force challenge his mastery; should, for that brief space of time, its fearful destructiveness become a danger to life or limb, it is automatically broken—by a device no bigger than his clenched fist.



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A name synonymous with Progress in Accessories and Switchgear

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Dependability in operation—the first essential in Switchgear—can be achieved only after long practical experience of design and construction. Rupturing Capacity Tests carried out on STATTER E.H.T. Metalclad Vertical Drawout Switchgear at recognised Testing Stations fully substantiate the conservative ratings assigned to gear of this type. The reputation for inherent reliability enjoyed by STATTER Switchgear is the outcome of knowledge accumulated during 50 years continuous Switchgear manufacture. All types are included in our extensive range—each eminently suitable for its specific purpose.

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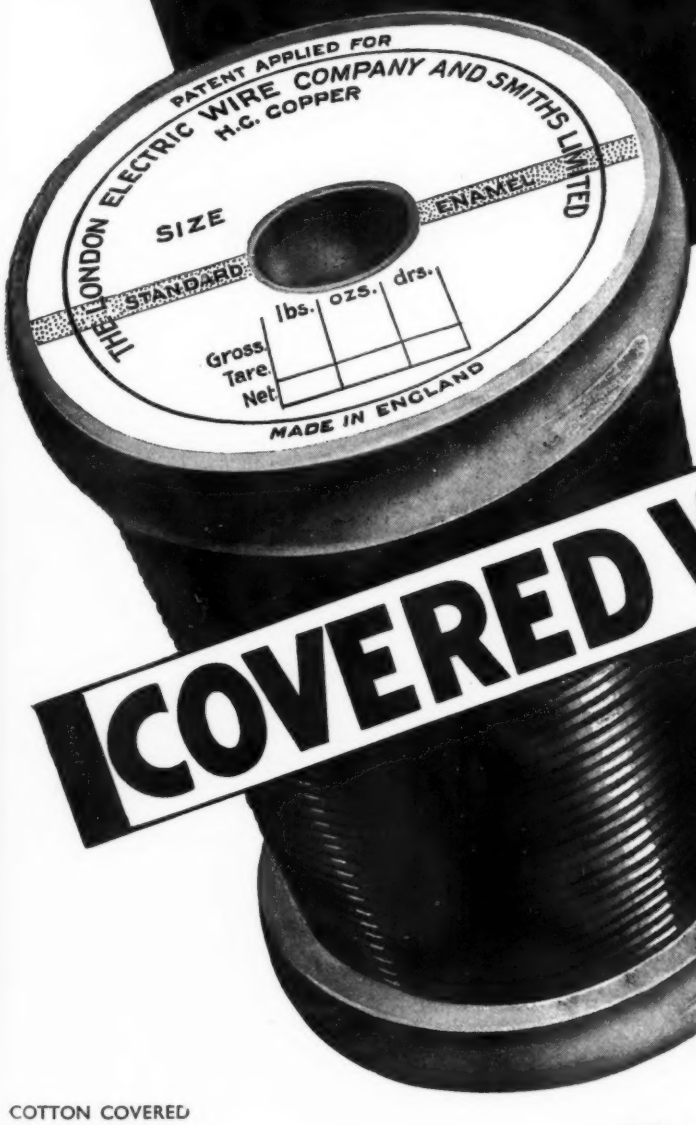

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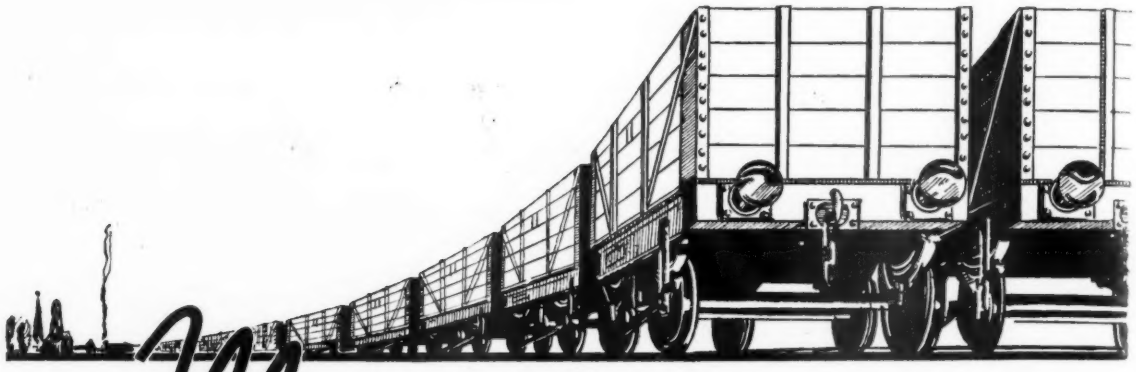

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For more than 30 years, Oldham Miners' lamps—with their Oldham Built-to-last Batteries—have been almost universally used in the collieries of this country. Nowhere is utter dependability more vital, nowhere are conditions more searching than in the mines. And it is from this most stringent proving ground that Oldham, with their unparalleled experience and versatility in battery manufacture, have built up a range of batteries for every conceivable purpose. Built as no other batteries are built, tested as no others are tested, Oldham Built-to last batteries ensure unswerving dependability under all conditions.

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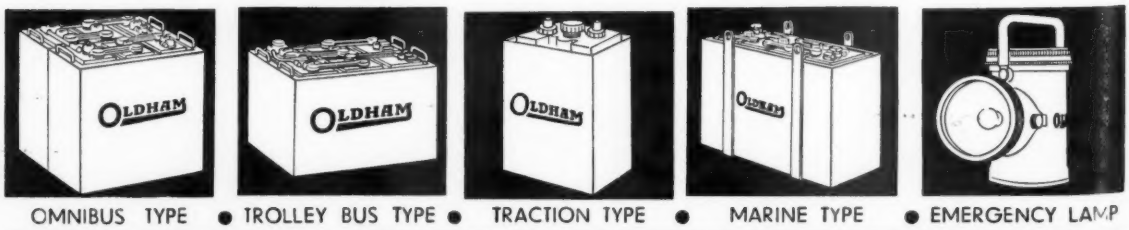

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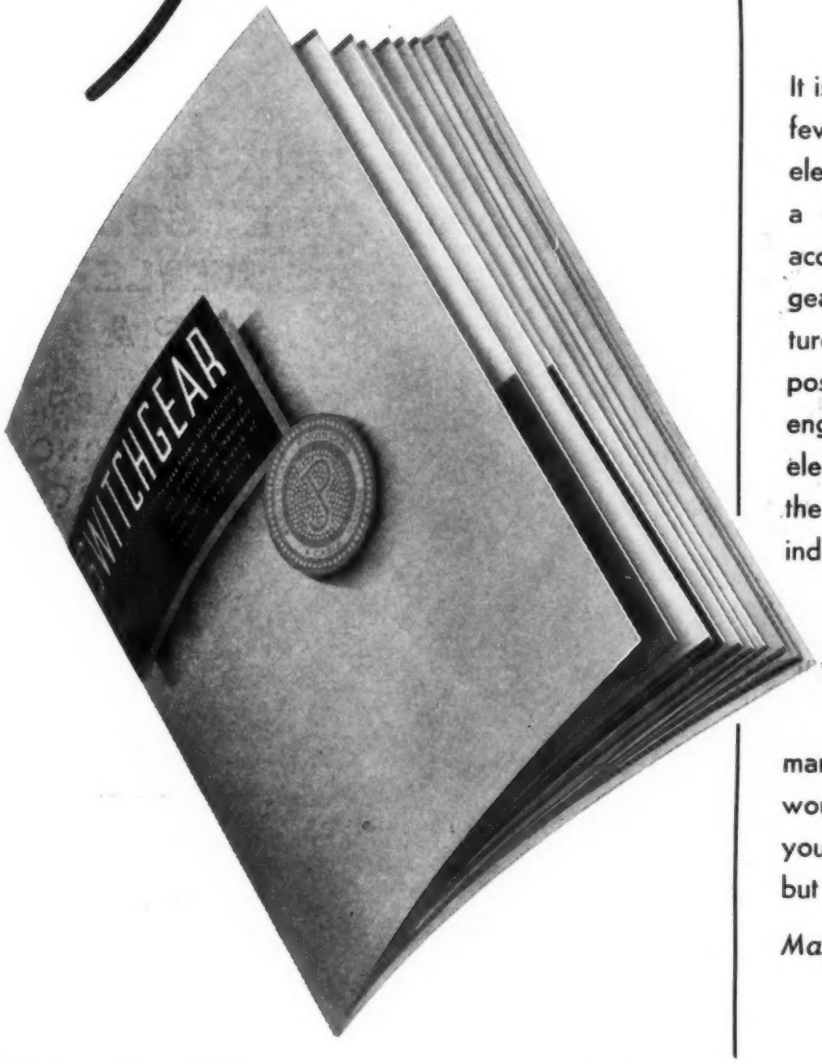
ONE OF THE J.&P. PAGES

J.&P. for Switchgear



It is our claim that there are few firms engaged in the electrical industry who have a wider or more intimate acquaintance with switchgear design and manufacture than we ourselves possess. We have been engaged in this branch of electrical production since the earliest days of the industry. Publication S.G.1, the latest and informative publication on J. & P. Switchgear, will indicate to you that we have many desirable designs that would serve and appeal to you not only in performance but in price.

May we send a copy of Publication S.G.1?

JOHNSON & PHILLIPS LTD.

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The mark that means that "little more" in quality

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A complete line to meet every cleaning requirement

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Advt. of The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT OR SITUATIONS WANTED.
Advertisements under these headings, if prepaid, are inserted at the rate of one penny per word (minimum 1s.). A box number counts as six words. (6d. extra charged for postage of replies.) If placed to account, the charge for each insertion is 2s. 6d. for three lines and 9d. for each additional line.
Three insertions—under the above headings only—can be secured for the price of two, if ordered and prepaid with the first insertion.
Original testimonials should not be sent with applications for employment.
Replies to Situations Vacant advertisements, published under a box number, if not to be delivered to any particular firm or individual, should be accompanied by instructions to this effect, addressed to The Manager of THE ELECTRICAL REVIEW, who will do his best to carry out such instructions. Letters of applicants in such cases cannot be returned to them. In no case will the name of an advertiser using a box number be disclosed.
Displayed advertisements :—14s. per inch (minimum one inch). (Three insertions at the cost of two if ordered and prepaid with the first insertion.)

"FOR SALE," "ARTICLES WANTED," "AGENCIES," "PARTNERSHIPS," etc.
Advertisements under these headings are inserted at the rate of 1s. 9d. per line per insertion. (This applies to all headings other than Situations Vacant or Wanted.)
Displayed advertisements :—14s. per inch (minimum one inch).

AUCTION NOTICES. 14s. per inch (minimum one inch).

ALL REPLIES TO BOX NUMBERS should be addressed to the Box Number, c/o THE ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1.

CLASSIFIED ADVERTISEMENTS must reach us by **5.30 p.m.** on **TUESDAY.**

OFFICIAL NOTICES.—TENDERS, ETC.

BOROUGH OF HESTON AND ISLEWORTH.

Proposed Public Swimming Bath, Twickenham Road, Isleworth.

ELECTRIC LIGHT AND POWER INSTALLATION SUB-CONTRACT.

THE Borough Council invite Tenders from specialist firms for carrying out as a sub-contract the Electric Light and Power Installation at the Proposed Public Swimming Bath, Twickenham Road, Isleworth, Middlesex.

Copies of the Drawings, together with an outline Specification and Forms of Tender, may be obtained on application to Mr. J. G. Carey, A.M.I.C.E., Borough Surveyor, Council House, Hounslow, on payment of a deposit of £2 2s. (Two Guineas), which will be refunded on receipt of a bona fide tender.

Firms submitting tenders must have had experience of electrical installation for Public Swimming Baths, and are required to submit with their tenders particulars of similar installations they have recently carried out.

Tenders must be delivered to the undersigned not later than noon Wednesday, July 7th, 1937, and must be submitted in a plain sealed envelope endorsed "Tender for Electric Light and Power Sub-Contract—Isleworth Baths." The envelope must not bear any name or mark indicating the sender. Tenders which do not comply with these requirements will not be considered. The Council do not bind themselves to instruct the General Contractor to accept the lowest or any tender.

HAROLD SWANN,
Town Clerk.

Council House,
Hounslow,
Middlesex.
17th June, 1937. 2099

CITY OF MANCHESTER.

THE Electricity Committee of the Manchester Corporation invites Tenders for the supply, delivery and erection and lagging at their Stuart Street Power Station of :—

A MAIN GAS DUCT FOR BOILERS
NOS. 65 and 66.
(Specification No. 601).

Specifications, etc., may be obtained on application to Mr. H. C. Lamb, Chief Engineer and Manager, Electricity Department, Town Hall, Manchester, 2, on payment of a fee of one guinea, which amount will be refunded on receipt of a bona fide tender.

Tenders, duly endorsed and addressed to the Chairman of the Electricity Committee, must be delivered at the Town Hall not later than 10 o'clock a.m. on Friday, 9th July, 1937.

The firm entrusted with the work will be required to enter into a contract to be prepared by the undersigned.

The Corporation does not bind itself to accept the lowest or any tender.

F. E. WARBRECK HOWELL,
Town Clerk.

Town Hall,
Manchester, 2.
21st June, 1937. 2098

COUNTY BOROUGH OF BOLTON.

Municipal Technical College.

THE Corporation of the County Borough of Bolton are about to invite Tenders for the Engineering Services for the new Technical College which is to be erected.

Contract No. 1.

Boilers, Steam and Condenser Services, Heating, Ventilating, Hot and Cold Water Services, Gas, Hydrants, etc.

Contract No. 2.

Electric Power, Wiring, Electric Lighting, Telephones, Clocks, etc.

Contractors wishing to tender for either of the above contracts should forward their names and addresses to Mr. John A. Cox, M.A., Director of Education, Education Offices, Bolton, on or before July 1st, 1937.

In applying, firms are to state any large contracts of a similar nature they have carried out.

The Corporation and their advisers will then select firms from those applying, who will be invited to submit their Tenders.

The general conditions, plans, and specifications may be inspected at the offices of the Consulting Engineer, Edwin S. Hoare, B.Sc., A.M.I.C.E., A.M.I.E.E., Lancaster House, 67, Newhall Street, Birmingham, and will be forwarded with form of Tender to the selected firms.

The Corporation do not bind themselves to accept the lowest Tender.

Signed, HAROLD B. ASHFORD,
Town Clerk.

Town Hall,
Bolton. 2113

IRISH FREE STATE.

Electricity Supply Board.

THE Electricity Supply Board invites Tenders for the supply, delivery and erection of :—

ONE 1,600 B.H.P. DIESEL ALTERNATOR SET AT THE PIGEON HOUSE GENERATING STATION, DUBLIN.

Form of Tender, Conditions of Contract and Specification may be obtained by manufacturers from the Chief Design Engineer, Electricity Supply Board, 37, Merrion Square, Dublin, C.18, by application and on payment of a fee of One Guinea, which will be refunded on receipt of a bona fide Tender. Additional copies may be purchased at a cost of Half a Guinea per copy (non-returnable).

Tenders, with all the relative documents, enclosed in a sealed cover, endorsed "TENDER FOR DIESEL ALTERNATOR SET," must be delivered to the undersigned not later than 12 o'clock noon on the 31st July, 1937.

The Board does not bind itself to accept the lowest or any Tender.

PATRICK J. DEMPSEY,
Secretary.

Electricity Supply Board,
60-62, Upper Mount Street,
Dublin, C.18. 2081

OFFICIAL NOTICES.—TENDERS, ETC.—*Contd.*

SHEFFIELD CORPORATION ELECTRICITY DEPARTMENT.

THE Electricity Committee are prepared to receive Tenders for the undermentioned works:—

*Specification No. B.M.*111.

One 13 Panel Board for 33 kV, 3-phase, 750 mVA rupturing Capacity, Indoor-type, Metal-clad Switchgear.

Contractors desiring to submit Tenders may obtain the Specification and Form of Tender at this Office on and after Monday, the 28th June, 1937, on making a deposit of £2 2s., which sum will be refunded on receipt of a bona fide Tender.

To meet the convenience of contractors, two copies of the Specification will be furnished; additional copies may be purchased at a cost of £1 1s. per copy.

Any person or firm sending in a Tender will be required to comply with the Standing Orders of the Council relating to the Standard Rates of Wages and proper hours and conditions of labour. A print of the Standing Orders may be obtained from the Department.

Tenders to be forwarded to the Town Clerk, Town Hall, Sheffield, 1, enclosed in the official envelope provided, which must be sealed and bear no name or mark indicating the sender, and received by him not later than the first post on Tuesday, the 13th July, 1937. Tenders received after the time stipulated herein will not be considered.

The Committee do not bind themselves to accept the lowest or any Tender.

JOHN R. STRUTHERS,
General Manager and Engineer.

Commercial Street,
Sheffield, 1.
June, 1937. 2138

COUNTY BOROUGH OF PRESTON.

Electricity Department.

TENDERS are invited from manufacturers for the supply and delivery of the following:—

House Service Type Electricity Meters, Domestic Water Heating Apparatus, Breakfast Cookers.

Specifications, conditions and form of tender may be obtained from the Borough Electrical Engineer, Lune Street, Preston.

Sealed tenders endorsed "Tenders for Meters," "Water Heaters," or "Breakfast Cookers," must be received by the undersigned not later than 10 a.m. on Tuesday, the 6th July, 1937.

HERBERT E. NUTTER,
Town Clerk.

Municipal Building,
Preston. 1795

NEWTON-IN-MAKERFIELD URBAN DISTRICT COUNCIL.

Electricity Department.

TENDERS are invited for the supply and delivery of:
ONE 400 KVA TRANSFORMER.

Specification, Form of Tender, and full particulars can be obtained upon application to Mr. W. Phœnix, A.M.I.E.E., Electricity Offices, Market Street, Earlestown.

Tenders, enclosed in plain, sealed envelope, and endorsed "Tender for Transformer," must be delivered not later than noon of Saturday, 10th July, 1937, to the undersigned.

J. H. WARREN,
Clerk of the Council.

Town Hall,
Earlestown,
Lancs. 2137

WIRING.

THE Commissioners of His Majesty's Works, etc., are prepared to receive Tenders before 11 a.m. on Friday, 9th July, 1937, for Rewiring I.R.O., 17, North Audley Street, W.1.

Drawings, Specification, a copy of the Conditions and Form of Contract and Forms for Tender may be obtained from Room 65D, Third Floor, H.M. Office of Works, London, S.W.1, on payment of One Pound. (Cheques payable to The Commissioners, H.M. Office of Works.) The sums so paid will be returned to those persons who send in tenders in conformity with the conditions. 2094

OFFICIAL NOTICES.—TENDERS, ETC.—*Contd.*

COUNTY BOROUGH OF WEST HAM.

Electricity Department.

TENDERS FOR COAL.

THE Council invite tenders for the supply of:—
COAL FOR GENERATING STATION
for twelve months ending 31st December, 1938.

Forms of Tender in duplicate, with Conditions attached, may be obtained on application to Mr. J. W. J. Townley, Engineer and Manager, Electricity Offices, 84, Romford Road, Stratford, E.15, on payment of the sum of £1 (one pound), which sum will be returned on receipt of a bona fide Tender.

No Tender will be considered unless the same is delivered at the Office of the Town Clerk, Town Hall, West Ham, E.15, in a plain sealed envelope, which must bear the word "Tender," followed by the subject to which it relates, but shall not bear any name or mark indicating the sender, not later than 12 o'clock noon on Monday, 12th July, 1937.

No Tender will be considered unless it is stated therein and proved to the satisfaction of the Council, if so required, that the Contractor at the date of the Tender pays to the whole of his workmen such rates of wages and observes such hours of labour as are recognised by the appropriate Workmen's Trade Unions in agreement with the Employers' Associations in the several localities where his work is done.

The Contract will contain clauses prohibiting the Contractor from assigning, under-letting or making a sub-contract with any other person or persons for the execution of any part of the Contract, together with a penalty clause which will be enforced by the Council in the event of any breach of these conditions.

The Council do not bind themselves to accept the lowest or any Tender.

The Contractor will be required to enter into a bond, with two sureties, for the due performance of the Contract, and no coal will be ordered under the Contract until such bond has been duly executed.

By Order of the Council.

CHARLES E. CRANFIELD,
Town Clerk.

Town Hall,
West Ham, E.15.
21st June, 1937. 2112

SITUATIONS VACANT.

HAZEL GROVE AND BRAMHALL URBAN DISTRICT COUNCIL.

Appointment of Junior Draughtsman.

APPLICATIONS are invited for the appointment of a JUNIOR DRAUGHTSMAN in the Electricity Department of the Council, at a commencing salary of £65-£100 per annum in accordance with the Lancashire and Cheshire Whitley Council Scale.

The appointment is subject to the Local Government and Other Officers' Superannuation Act, 1922, and the successful candidate will be required to pass a medical examination.

Applicants must be between the age of 18 and 20 years, have had a sound education and training in draughtsmanship, and be fully conversant with the keeping of mains records.

Preference will be given to applicants who hold the Matriculation or School Certificates.

Applications, in the candidate's own handwriting, stating age, qualifications, particulars of education and training, together with copies of not more than two recent testimonials, should be received by the Engineer and Manager, Electricity Offices, Chapel Street, Hazel Grove, endorsed "Junior Draughtsman," not later than first post on SATURDAY, 10th JULY, 1937.

F. E. CAPPER,
Clerk of the Council.

The Council House,
Hazel Grove,
Cheshire.
14th June, 1937. 2033

ELECTRICITY SUPPLY AUTHORITIES.

OLD-Established Manufacturers desire to make contact with a gentleman of established position, persona grata with chiefs of important supply authorities. The appointment will not necessarily involve whole-time service.—Box 9834, c/o The Electrical Review.

SITUATIONS VACANT.—*Continued.*

BOROUGH OF BROMLEY.

Electricity Department.

ASSISTANT SALESWOMAN-DEMONSTRATOR.

APPLICATIONS are invited for the position of an ASSISTANT SALESWOMAN-DEMONSTRATOR in the Showrooms of the Electricity Department at a salary of £100 to £120 per annum, according to experience.

Particulars of experience, together with age, date when duties could commence, and copies of testimonials, should be forwarded to reach W. G. Trend, A.M.I.E.E., Borough Electrical Engineer, 1, West Street, Bromley, Kent, not later than 10 a.m. July 5th, 1937. Envelopes should be endorsed "Assistant Demonstrator."

The position is not established and will be subject to one month's notice on either side.

S. CRITCHLEY AUTY,
Town Clerk.

Municipal Offices,
Bromley, Kent.
June 21st, 1937. 2130

METROPOLITAN BOROUGH OF HAMMERSMITH

Electricity Department.

APPOINTMENT OF TWO OUTSIDE REPRESENTATIVES.

APPLICATIONS are invited for the appointment of Outside Representatives. Applicants should not be more than 40 years of age and must have a sound knowledge and experience of electrical domestic appliances, hire schemes, tariffs, etc.

Salary—£210 per annum, rising by annual increments of £10 to a maximum of £250 per annum.

The appointments will be subject to the provisions of the Council's Superannuation Scheme and to the successful candidates satisfactorily passing a medical examination.

Applications, on forms obtainable from the Chief Electrical Engineer, "Electric House," 154, Uxbridge Road, W.12, upon receipt of a stamped addressed foolscap envelope, must be returned to the *undersigned* not later than 9 a.m. on MONDAY, 5TH JULY, 1937, endorsed "Outside Representative."

Canvassing will disqualify.

HUGH ROYLE,
Town Clerk.

Town Hall, Hammersmith, W.6.
23rd June, 1937. 2123

CITY OF WINCHESTER.

Electricity Department.

IT is intended to appoint a lady in the Installation Department to assist the Consumers' Engineer in all matters connected with the hire and sale of electrical apparatus and fittings, also certain clerical work associated therewith.

Applications are invited from persons having a knowledge of domestic science and some previous experience in an Electricity Supply Undertaking. They must be of good appearance and address, competent to interview and advise consumers and to demonstrate the use of all classes of apparatus (some knowledge of canvassing would be an advantage).

Salary £165 per annum.

Applications, stating age, qualifications and previous experience, together with copies of any testimonials, must be received by the undersigned not later than the 12th July, 1937.

R. AYTON,
City Electrical Engineer.

Corporation Electricity Department,
Gordon Road,
Winchester.
18th June, 1937. 2095

THE LANCASHIRE ELECTRIC POWER COMPANY.

APPLICATIONS are invited for the position of Assistant Switchboard Attendant at Kearsley Power Station.
Commencing salary Class J, Grade 10c.
Applications should be sent immediately to the Generation Engineer, Kearsley Power Station, Stoneclough, Near Manchester. 2139

SITUATIONS VACANT.—*Continued.*

CROWN AGENTS FOR THE COLONIES.

Colonial Government Appointments.

APPLICATIONS from qualified candidates are invited for the following post:—

MECHANICAL AND ELECTRICAL ENGINEER required by the Government of the Gold Coast for the Public Works Department for 2 tours each of 12-24 months, with possible permanency. Salary £475 a year for 2 years, then £500-25-£600-30-£840. Free passages and quarters and liberal leave on full salary. Candidates, aged 28-36, must have received a thorough training as Mechanical Engineers and be Associate Members of the Institution of Mechanical Engineers or possess similar qualifications, and should have a sound theoretical and practical knowledge of compression ignition, internal combustion engines and pumping machinery. They should also have a working knowledge of both A.C. and D.C. electrical generation and distribution.

Apply at once by letter, stating age, whether married or single, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting M/5280. 2119

AIR MINISTRY.

Directorate of Works.

APPLICATIONS are invited for temporary appointments as Mechanical and Electrical Engineering Assistants in the Drawing Office at the Air Ministry and at R.A.F. aerodromes in the provinces at a salary up to £420 per annum according to qualifications and experience.

Only applicants with first-class training and experience, aged 30 to 45 years, will be considered.

Candidates must be capable of design work and preparing finished drawings of complete electrical power and lighting schemes for aerodromes, internal equipment of domestic buildings, workshops, aeroplane sheds. Preference will be given to candidates with mechanical engineering experience of power plants, water supply and sewage disposal works.

Application for forms should be made by postcard addressed: The Secretary, Air Ministry (W.9), Adastral House, Kingsway, London, W.C.2. 2124

LONDON COUNTY COUNCIL.

TECHNICAL ASSISTANTS required by London County Council to assist in preparation of schemes and specifications for the electrical equipment of all types of buildings, hospitals, schools, offices, etc. Candidates must have experience in such work and must hold Higher National Certificate in Electrical Engineering or its equivalent.

The maximum rate of pay is £8 a week, and selected applicants will be engaged at a commencing rate of pay within this maximum, dependent upon their qualifications and experience.

Application forms obtainable by sending stamped adressed foolscap envelope to The Chief Engineer, Z (37/39), The County Hall, Westminster Bridge, S.E.1, returnable with copies of three recent testimonials not later than 3rd July. Canvassing disqualifies. 2129

COUNTY BOROUGH OF WEST HAM.

Municipal College, Romford Road, Stratford, E.15.

APPLICATIONS are invited for the post of Evening Lecturer in Electrical Installation—Regulations, Theory and Workshop, for the session commencing in September next. Salary at the rate of 16s. per evening.

Full particulars, together with Form of Application, may be obtained from the Principal, and must be returned to him not later than SATURDAY, July 3rd, 1937.

CHARLES E. CRANFIELD,
Town Clerk and Education Officer.
15th June, 1937. 2097

BATTERSEA POLYTECHNIC, S.W.11.

Electrical Installation Work.

TEACHER required for one evening per week, commencing in September, to give lectures and supervise practical work of 1st year course in above subject. City and Guild's Syllabus. Remuneration 16s. per evening.

Applications to Principal before July 7th. 2128

SITUATIONS VACANT.—*Continued.*

DISTRIBUTION ENGINEER.

APPLICATIONS for the above position are invited from candidates having sound technical knowledge and practical experience in designs and estimates for and construction and operation of E.H.T. and L.T. underground and overhead rural supply systems. Commencing salary £350 per annum. Applications must be on form to be obtained from the undersigned.

Engineer and Resident Manager,
West Hampshire Electricity Company, Limited,
Electricity House,
Lyndhurst, Hants.
2142

SALES ELECTRICAL ENGINEER FOR INDIA.

ELECTRICAL Sales Engineer required by English firm in India, age 22-26, must be fit to pass strict medical examination and have sound general and technical education. Preference given to man with University degree and two years' apprenticeship in recognised works. Alternatively, School Certificate and five years' apprenticeship. Previous sales experience not necessary, but Switchgear (up to 11 kV). Manufacturing and estimating experience is an asset. Four years' agreement. Salary: Rupees 600 per month for first year, increasing 50 Rupees per month, yearly. First class passages and six months leave from India on re-engagement.—Reply Box 1991, c/o The Electrical Review.

METER SALES.

WELL-KNOWN Manufacturers require gentleman of high standing, having first-class connection with and proved ability to do business with chiefs of large supply authorities.—Box 9769, c/o The Electrical Review.

ARMATURE Winders and Improvers, A.C. and D.C. repairs. S.W. London District, full particulars, rate, etc.—Box 2029, c/o The Electrical Review.

CHIEF Mechanical Inspector required with experience on mass production of piece parts and components in radio trade. Practical mechanical training and sound technical education essential. Electrical knowledge an advantage.—Write, stating fully age, education, engineering training, positions held and salary required, to Box 2134, c/o The Electrical Review.

COMPETENT Man required to take charge of radio valve and electrical accessories dept. Excellent opportunity to live man with adequate technical knowledge and good connections.—Particulars, in confidence, to Managing Director, Batwin Electrical Appliances, Ltd., 138, Southwark Street, S.E.1. 2069

CONDENSER Engineers required by large Electrical Manufacturer in the Midlands. Must be experienced designer and familiar with modern methods of manufacture for large scale production of wax type power factor correction condensers. Give full particulars, including age, experience, present salary and salary expected.—Apply Box 1912, c/o The Electrical Review.

CONSULTING Electrical Engineer requires Graduate I.E.E. as additional assistant. Technical College and Works training and experience in Wiring essential, and must be neat draughtsman. Commencing salary £250.—Apply by letter, giving full particulars to F. C. R., Napier House, 24-26, High Holborn, W.C.1. Personal or telephone calls without appointment will disqualify. 2125

DIAGRAM of connections of Automatic Switchgear. Draughtsman wanted—Apply giving particulars of experience and salary required to the Secretary, Watford Electric & Mfg., Co., Ltd., Whippendell Road, Watford. 2020

DRAUGHTSMAN Designer for works in Birmingham; fully conversant with A.C. switch and control apparatus.—Apply, by letter, stating fully qualifications, age and salary, Box 2074, c/o The Electrical Review.

DRAUGHTSMAN, experienced in design of power transformer apparatus, for works in Midlands.—Applications to Box 1902, c/o The Electrical Review.

DRAUGHTSMAN for London Contracts Department, Westminster district, experienced in lay-outs, electric motor drives. State age, experience and salary required.—Box 2106, c/o The Electrical Review.

DRAUGHTSMEN.—Bruce Peebles & Co., Ltd., Edinburgh, require a number of Transformer Draughtsmen.—Apply to Chief Engineer, stating age, training, experience and salary required. 1995

DRAUGHTSMEN.—Electrical Engineers in Midlands have several vacancies for men having good experience in design of control and contactor gear and diagram work.—Applications, stating age, experience and salary required, to Box 1901, c/o The Electrical Review.

SITUATIONS VACANT.—*Continued.*

DRAUGHTSMEN required immediately by firm manufacturing all classes of radio apparatus within easy reach of London. Experience and adaptability essential. Good salaries paid to the right men.—Apply in first instance, giving full particulars of experience and salary required, to Box 2101, c/o The Electrical Review.

DRAUGHTSMEN required (Senior and Junior) experienced in mechanical layout and design of radio apparatus, including transmitters and receivers.—Write, stating age, experience and salary required, to Box 2073, c/o The Electrical Review.

DRAUGHTSMEN (Senior and Junior) required for the following: (A) High and low tension switchboard design, (B) Motor control gear, (C) Oil circuit breaker and metal-clad switchgear.—Apply, stating age, experience, technical education and salary required, to the General Electric Company, Limited, Switchgear Department, Engineering Works, Witton, Birmingham, 6. 2083

DRAUGHTSMEN, Senior and Junior, required, fully experienced in design and development of on-load tap-change gear for transformers.—Reply, giving full particulars of experience and salary required, to Hackbridge Electric Construction Co., Ltd., Hersham, Walton-on-Thames, Surrey. 1932

ELECTRIC motor winding and repair shop, London, requires smart man, also improvers, for small and medium-size machines. Permanent employment.—Box 1970, c/o The Electrical Review.

ELECTRICAL and radio manufacturers require man for technical department with sales knowledge, especially of transformers and rectifying equipment.—Age, salary, Box 2120, c/o The Electrical Review.

ELECTRICAL Contractor's Foreman required for supervision of electrical installations, all classes. Efficient control of men essential. London district.—Box 1889, c/o The Electrical Review.

ELECTRICAL Contractors (London), carrying out large installation work, require Engineer, able to take control. State experience, age, salary.—Box 9828, c/o The Electrical Review.

ELECTRICAL Engineer required, fully qualified, with knowledge of electrical measuring. Must have knowledge of German.—Write, giving full details, qualifications, etc., Box 2108, c/o The Electrical Review.

ELECTRICIAN wanted for mine work on Gold Coast. Applicants should have had experience of A.C. distribution up to 6,600 volts 3-phase and be conversant with mining practice. Ability to do own rewinds a recommendation. Salary offered £40 per month, engagement for one year with three months' leave on half pay and renewal of agreement if satisfactory. Free passage out and back, free quarters and medical attendance.—Apply in writing, giving full particulars of apprenticeship, subsequent training and experience, and stating age, to "H.D.," c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4. 2090

INSTRUMENT Maker.—Assembler-Wireman required for small model shop in S.W. District, London.—Write, not later than June 30th, giving age and experience, to Box 339, c/o E. W. Barney, Ltd., 346, Strand, London, W.C.2. Envelopes should be marked R.D. 9855

JUNIOR Draughtsman having experience of electricity meters. Preference will be given to those possessing intimate knowledge of prepayment mechanisms. Progressive position. State salary required, age, etc. London area. Successful candidate may have to subscribe to a pension scheme.—Box 9818, c/o The Electrical Review.

JUNIOR Shift or Improver for small station. Steam, Diesel and bulk supply. A.C. and D.C. switchgear. Wage £3 10s., rising £3 15s. in one year.—Applications, with full particulars and references by first post on Friday, 2nd July, 1937, to the Electrical Engineer, U.D.C. Electricity Works, Stanley Street, Horsham, Sussex. 2096

JUNIOR Stores Assistant required in London for a large firm of conduit manufacturers. Must have general knowledge of conduit fittings and accessories. Age 18 to 21.—Apply in first instance by letter, to Box 2135, c/o The Electrical Review.

JUNIOR Traveller, connection with electrical and radio manufacturers preferred. Salary and commission.—Box 9819, c/o The Electrical Review.

LADY Shorthand Typist, age about 25, required for Estimating Dept. of Electrical Manufacturing Engineers. Hendon district. Only those with experience of electrical terms need apply. Salary 52s. 6d. per week.—Write Box 9820, c/o The Electrical Review.

LADY Tracer, 20-24 years, for London (S.W. district), drawing office of well-known electrical engineers; salary up to 45s. according to age and experience; contributory pension scheme.—Write age, experience, etc., Box 9896, c/o The Electrical Review.

LAMP representative required for Manchester area, only those with sound connection among contractors and large users need apply.—Box 2056, c/o The Electrical Review.

SITUATIONS VACANT.—*Continued.*

LANCASHIRE Electrical Factor Require competent Man to organise fittings Showroom. Only applicants with previous experience and knowledge of buying, etc., considered. State experience, age and salary required.—Box 2128, c/o The Electrical Review.

LAYING G.P.O. cables and ducts. Manchester firm of public works contractors require experienced Engineers for estimating and supervising work to G.P.O. specifications.—Apply, stating age, experience, salary and allowances required, Box 2107, c/o The Electrical Review.

LIFT Lay-out Draughtsman required. Permanency and good wages to good man.—Breakells Lift, Blackburn. 2111

MANAGER of Electrical Section of Engineering Company, experienced in design, estimating and production of motors, generators, control and switch gear up to 50 kW. Permanent position for capable energetic man.—State age, experience, salary required to Box 2085, c/o The Electrical Review.

METER Engineer.—Young man, 22-28, having ability and experience of single and polyphase meters. Commencing salary £4 to £4 15s. weekly. London area. Successful candidate may have to subscribe to a pension scheme.—Box 9817, c/o The Electrical Review.

MIDLAND firm require man to take charge of test bed instruments. Must be capable of maintaining, repairing, and calibrating indicating meters. State experience and salary required.—Box 2071, c/o The Electrical Review.

OPENING for Energetic Young Man in Old Established Lamp Factory. Sound general, technical and electrical knowledge and experience essential. Some chemical knowledge desirable.—Apply, giving salary required, full details and references, to Box 1908, c/o The Electrical Review.

PRODUCTION Engineer required, experienced in the methods of manufacture and in the control of a large department manufacturing radio component parts and complete receivers.—Reply, giving full particulars of firms at which previously employed, capacity in which employed and reasons for leaving, also give full particulars of education, age and salary required, Box 2075, c/o The Electrical Review.

RADIO Charge Hand for set assembly, used to conveyor belts.—Apply personally, or by letter, to Personnel Manager, Kolster-Brandes, Ltd., Sidcup, Kent. 2103

RADIO Engineer, with degree or equivalent and sound knowledge of short wave measurements and/or high quality reproduction. Experience of factory test methods desirable. —Send full details of career with age and salary required to Ref. 4/E.R., Box 2088, c/o The Electrical Review.

RELAYS.—Sales Representatives required for London area, having an established connection with manufacturers and other consumers of relays. State full particulars.—Box 9823, c/o The Electrical Review.

REPRESENTATIVE for Yorkshire and surrounding territory required by well known firm of Cooker Manufacturers. Connection amongst Supply Authorities and Wholesalers essential. Salary, expenses and car. Write giving full particulars and salary required.—Box 2054, c/o The Electrical Review.

REPRESENTATIVES wanted to sell the productions of a well-known company, specialising in the manufacture of insulated wires. Can be worked in conjunction with present occupation. Applicants must have sound established connection with firms using this class of commodity. Competitive prices. Commission only to commence with. Areas to be covered :—London, Birmingham, Yorkshire, Glasgow, Bristol. —Box 1979, c/o The Electrical Review.

REQUIRED, capable Representative (with connection) by old-established electrical wholesalers for London and district.—Write full details of previous employment, approximate turnover, salary required, and state of car available, Box 9841, c/o The Electrical Review.

REQUIRED for service in India, on the Madras and Southern Mahratta Railway, a fully qualified Electrical Engineer, age about 36 years, preferably with previous railway experience. Engagement in the first instance would be for a term of three years, with free first-class passage to India and home again on satisfactory termination of agreement, which could be extended by mutual consent. The successful applicant would be appointed to the Company's Junior Scale of Officers at a salary equivalent to £630 per annum with prospects of very early promotion to the Senior Scale, District rank, when the salary would be about £975 per annum, rising by increments to £1,215 per annum. Applications should be made by letter, giving age, experience and qualifications, not later than 10th July, 1937, addressed to the Secretary, Madras and Southern Mahratta Railway Co., Ltd., 25, Buckingham Palace Road, London, S.W.1. 2141

RUGBY Corporation invite applications for the appointment of full-time meter reader from persons who have had experience in prepayment meter collection, the wages to be in accordance with No. 5 D.I.C. rates, which at present are £3 per week.—Applications, enclosing copies of two testimonials, are to be sent to the Borough Electrical Engineer, 24, Dunchurch Road, not later than the 2nd July, 1937. 2080

SITUATIONS VACANT.—*Continued.*

SALES Engineer with best connections, ambitious to progress with the firm, wanted by factory making transformers, 1-300 kVA.—Box 2076, c/o The Electrical Review.

SEVERAL young men required with experience in manufacture and calibration of mechanical and electrical measuring instruments.—Write to Cambridge Instrument Co., Chesterton Road, Cambridge, giving full particulars of experience, etc. 2092

SPARE-TIME Estimator wanted by London contractor carrying out first-class work. State experience and particulars.—Box 9839, c/o The Electrical Review.

STOREKEEPER-clerk required by electrical contractors. State age, experience and wage required.—Ernest Tucker, 63, Victoria Road, Ruislip, Middx. 1967

STOREKEEPER.—Manufacturers of Electrical and Scientific Instruments, North London district, require Storekeeper. Only those fully conversant with piece parts, metals, wires and Engineers' tools need apply. State full particulars and salary required in the first instance.—Box 2136, c/o The Electrical Review.

TELEVISION.—A vacancy exists on the staff of a large industrial organisation for an Engineer with University degree who has had experience with television transmission. Excellent prospects.—Reply by letter, giving full particulars and salary required, to Box 9734, c/o The Electrical Review.

TEST Room Assistant required by Sound Film Reproducing Equipment Company, London. Applicants must have good technical training and several years' practical experience in assembly and adjustment of high-class instrument or amplifier equipment. Position offers prospects of advancement to field engineering staff.—Write, giving full particulars of age, training, experience and salary required.—Box 1925, c/o The Electrical Review.

TIME Switches.—Sales Representatives required for London district, having an established connection with contractors, factors and manufacturers. State full particulars.—Box 9822, c/o The Electrical Review.

TRANSFORMER Draughtsmen required with experience of general transformer detail work and lay-out of on-load tap-changing gear.—Write experience, age, salary, to Bryce, Ltd., Transformer Division, Kelvin Works, Hackbridge, Surrey. 2102.

TRANSFORMERS.—Man with good knowledge workshop practice required as Foreman to supervise assembly of all sizes power transformers; experience of tap changing gear assembly an advantage but not essential qualification. Good prospects for suitable applicant.—Box 2091, c/o The Electrical Review.

TRAVELLER required for London and Southern Suburbs with established connection by electrical wholesalers.—Write full particulars of expected turnover, terms required, and previous experience to Box 9842, c/o The Electrical Review.

VACANCIES in large Repair Works for first-class Winders and Improvers.—Apply Midland Electric Installation Co., Ltd., Wolverhampton. 2087

WANTED, Electrical Draughtsman familiar with lift controllers, auxiliary switches and operating boxes; able to prepare wiring diagrams, A.C. and D.C.—Apply Waygood-Otis, Limited, Falmouth Road, S.E.1. 2070

WANTED, Junior Draughtsman for D.C. starters and control gear.—State age, experience and wage required to Sunderland Forge & Engineering Co., Ltd., Pallion, Sunderland. 2110

WANTED, live and energetic Salesman Canvasser for the East Midland area, good prospects.—Apply Box 1969, c/o The Electrical Review.

WINDER and Improver required for repairs; London district. State experience and wages.—Box 9844, c/o The Electrical Review.

WORKS' Foreman for small factory in the provinces, producing Electrical Cooking and Heating Appliances. A man with initiative and actual experience of such goods, capable of introducing and producing efficiently and economically new lines will receive every encouragement. Single man preferred.—State full particulars of age, experience and salary required to Box 9816, c/o The Electrical Review.

YOUNG Man, 22-28, as responsible assistant on production, electrical manufacturing, qualifications—machine shop, test room, technical training. Able to take charge of section.—State age, precise experience, salary required, to Best Products, Ltd., Felix Works, Felix Road, Felixstowe. 2079

YOUTH, 15-16, to train as Representative for Lighting Engineers. Start office, typing, drawing. Progressive post for suitable lad.—Davis Bros., 22, Buckingham Street, Strand, W.C.2. 2140

APPOINTMENTS FILLED.

Dissatisfaction having been so often expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision. We will then insert a notice free of charge under this heading.

SETTLE and District Electricity Co., Ltd. (Stores and Order Clerk); Yorkshire Electric Power Co. (Shift Charge Engineer).

SITUATIONS WANTED.

A CAPABLE all-round Electrician (44), energetic, reliable, seeks position; power, lifts, lighting, telephones, etc.; used taking complete charge, managing labour, interviewing and estimating.—Box 9748, c/o The Electrical Review.

A TECHNICAL Engineer having specialised knowledge of meters and instruments, telephone equipment, etc., office and works organisation all departments, seeks responsible and progressive post.—Box 9619, c/o The Electrical Review.

A YOUNG Engineer (age 25), Grad. I.E.E., Diploma in Electrical Engineering, sound Technical Training, desires progressive position in light electrical industry (apparatus) after 6 years' practical experience in same. Highest references. London district preferred.—Box 9859, c/o The Electrical Review.

ADVERTISER, own car, South Coast connection, desires to represent electrical company, commission and expenses.—"C.," Bee Hive, Devonshire Square, Bexhill-on-Sea. 1954

ALL-ROUND Electrical Mechanic, long experience manufacture and repair small electric motors and general apparatus; competent, practical, electrical and mechanical; reasonable technical knowledge; take charge if required. London area.—Box 9793, c/o The Electrical Review.

ALL-ROUND experienced Electrician, any capacity, erection or maintenance. Highest references. Any distance.—Box 9837, c/o The Electrical Review.

AN experienced Meter Fitter, a.c. and d.c., having experience of installation inspecting, age 28, would like to hear of progressive opening; present engaged London undertaking.—Box 9832, c/o The Electrical Review.

ASSISTANT Engineer, 26, offers services to supply or mining company abroad, preferably Africa; 12 years (including apprenticeship) with large Supply Company, experience generation, transmission, distribution.—Box 9833, c/o The Electrical Review.

ASSISTANT Manager, electrical repair shops, 20 years experience seeks change.—Box 9779, c/o The Electrical Review.

ASSISTANT or Charge Electrical Engineer, age 26, apprenticeship works and office experience, desires change; outer West London preferred.—Box 9746, c/o The Electrical Review.

ELECTRIC Lamps. Reliable representative with sound connection in the North East Coast area is open to represent good firm of manufacturers, also for Bakelite, accessories, &c.—Box 9777, c/o The Electrical Review.

ELECTRICIAN, charge large installations, all systems, light, power.—Box 9791, c/o The Electrical Review.

ELECTRICIAN desires change, London district; experienced in all systems, knowledge of estimating, hour or contract; interviews welcomed.—Box 9786, c/o The Electrical Review.

ELECTRICIAN, experienced all systems.—W. Gooch, 22, Tintern Avenue, The Hyde, N.W.9. 9807

ELECTRICIAN, first class, charge or otherwise; age 42; possesses initiative, organising abilities; able to estimate, interview; large contracts or small competitive jobs.—220, Philip Lane, N.15. 9838

ELECTRICIAN, screwed barrel installations, motors, lighting, 'phones, batteries.—Box 9756, c/o The Electrical Review.

ELECTRICIAN-Wireman, aged 34, 20 years' installation experience, 9 years last job as working charge hand, a.c.-d.c. power, lighting, heating, radio, talkies and theatre work; any references.—Saunders, 227, Galliard Road, N.9. 9829

ELECTRICIAN-Wireman, all systems, good references.—R. Pope, 25, Newquay House, Kennington, S.E.11. 9843

ELECTRICIAN, young, seeks situation, experienced all systems of installation, distance no object.—H. Jackson, 39, Lowman Road, London, N.7. 9826

ELECTRICIAN (33), any system, 8 years with Supply Company, O.H. services, estimating, etc., change-over work (preferably not London).—Box 9831, c/o The Electrical Review.

ENGINEER desires progressive situation, home or abroad. Experienced in electrical contracting, works experience in erection and testing, transformers, control gear, mercury-arc rectifiers, etc. Test-room charge hand.—Box 9840, c/o The Electrical Review.

ENGINEER, seeks appointment, position of responsibility, late C. o. W. (elec. and mech.) to large contracts, 18 years practical experience.—Box 9775, c/o The Electrical Review.

ENGINEER (31) desires situation; first-class experience in a.c. and d.c. erection and maintenance, home and abroad; five years' test experience with large manufacturing company; sound technical training.—Box 9825, c/o The Electrical Review.

ENGINEER, 36, excellent qualifications and wide experience erection and maintenance, seeks responsible position.—Box 9830, c/o The Electrical Review.

SITUATIONS WANTED.—*Continued.*

EXPERIENCED Storekeeper-Counterman seeks change. Good knowledge of radio and electrical parts.—Box 9853, c/o The Electrical Review.

FOREMAN (V.I.R. Cables), 25 years' experience, extruding, curing, braiding, compounding, flexibles, switchboard. 28 years with one firm, now closed; rationalisation.—Box 9732, c/o The Electrical Review.

PLUMBER-Jointer, capable, seeks re-engagement.—Box 9790, c/o The Electrical Review.

MAINTENANCE Engineer.—An efficient Maintenance and Construction Engineer desires change, well versed in all classes of power generation and application in mills and factories, practical experience of turbo-generators, boilers, electric installations, drying and ventilations, etc.; capable of submitting economy schemes and taking complete charge of entire staff; age 44.—Box 9827, c/o The Electrical Review.

PUBLIC Supply Co.'s L.T. Linesman and Electrician, Wireman, all systems, at present general foreman to small district of large firm, 9 years with present firm, desires change; used to H.T. operation, a.c. and d.c. distribution, service work, testing, etc.; age 28.—Box 9821, c/o The Electrical Review.

REPRESENTATIVE, regularly calling on factors throughout Great Britain with a well-known exclusive line, is desirous of running one other good line.—Box 9741, c/o The Electrical Review.

REPRESENTATIVE requires additional lines, established connection, Southern Counties; own car.—Box 9706, c/o The Electrical Review.

SALESMAN-Engineer, 41, disengaged; connection municipal undertakings, electrical contractors and mills, etc., Midlands and Potteries. Has represented leading houses 18 years. Ex R.A.F. officer.—Box 9752, c/o The Electrical Review.

STOREKEEPER, excellent references, long experience cable, conduit, and lighting accessories, seeks permanent appointment at salary about £3 per week.—Box 9745, c/o The Electrical Review.

YOUNG Man requires part time jobs, good references. London Area.—Box 9858, c/o The Electrical Review.

YOUNG man, single, Linesman or Mate, desires opening on outside staff with firm of electrical engineers. Free to go anywhere.—Box 2086, c/o The Electrical Review.

WIREMAN wants job, any system.—R. Robinson, 5, Agincourt Road, Hampstead, N.W.3. 9808

FOR SALE.

Advertisements under this display section are inserted at 14s. per inch (minimum one inch).

COMPLETE INSTALLATION.

ONE 135 kW Cold Starting Crude Oil Engine Driven Generating Set comprising 200 h.p., 2-cylinder Vertical Crude Oil Engine (National), 1929 make; direct coupled through massive flywheel to 135 kW open type Compound Interpole Generator (E.C.C.), 225 volts, 600 amps., 275 r.p.m.

One 276 kW Ditto, comprising 400 h.p., 4-cylinder Vertical Crude Oil Engine (National), 1929 make; direct coupled through massive flywheel to 276 kW, open type Compound Interpole Generator (E.C.C.), 225 volts, 1,225 amps., 275 r.p.m. *This Set has actually worked less than 4,000 hours.*

With all accessories, viz.: Switchboards, Motor Driven Air Compressor, Air Vessels, Fuel Tanks, Circulating Pump, Air, Water and Oil Piping, etc., suitable for running either singly or in parallel. Just left off work.

An excellent complete installation at a reasonable price.
Other Sets in stock.

THOS. W. WARD LTD., ALBION WORKS, SHEFFIELD.
'Phone: 23001 (12 lines). 'Grams: Forward, Sheffield. 3068

ERITH URBAN DISTRICT COUNCIL.

Electricity Department.

SCRAP MATERIAL.

TENDERS are invited for the purchase of a quantity of scrap copper, lead, brass, cast iron, switchgear, motors and instruments, at Walnut Tree Road Transforming Station.

Tenders must be made on the official form, copies of which will be furnished on application to the Electrical Engineer and Manager, Walnut Tree Road, Erith.

The material may be inspected by appointment.

Tenders in plain sealed envelopes endorsed "Tender for Scrap Material," must be addressed to the undersigned and received not later than 12 noon, Thursday, the 8th of July.

D. S. TWIGG,
Clerk of the Council.

Council Offices,
Erith.
21/6/37. 2133

FOR SALE.—*Continued.*

NEWMAN INDUSTRIES LIMITED
Electrical and Mechanical
Engineers and Manufacturers

for "NEWmanised," i.e., specialist reconditioned, tested, and guaranteed—

MODERN A.C. & D.C. MOTORS AND PLANT

of reputable British manufacture offered virtually as new at used plant prices. Purchase of "NEWmanised" is sound investment free from the hazards of speculation. May we mail you current catalogue and quotations?

Head Offices and Works, Yate, Bristol.

'Phone: "Chipping Sodbury 111." *'Grams*: "Dynamo, Yate." *Also* 32, Victoria St., Westminster, S.W.1. *Tel.*: *Vic.* 2023; *and* Royal London House, 196, Deansgate, Man. *Blackfriars* 5423. 19

GEORGE COHEN, SONS & COMPANY, LTD.,
FOR RECONDITIONED AND GUARANTEED
A.C. AND D.C. ELECTRICAL
MOTORS AND EQUIPMENT.

Write our nearest depot:
Wood Lane, London, W.12. 'Phone:
Shepherd's Bush 2070,
and
Stanningley Works, near Leeds.
'Phone: Stanningley 71171. 2121

EXCELLENT STEAM ALTERNATOR SET BY BELLIS.
For Sale.

ONE 500-kW Belliss & Morcom Compound Engine No. 7500, direct coupled to 500-kW Mather & Platt Alternator, with switchboard, 415 volts, 3-phase, 50 cycles, with Surface Condenser and Motor-driven Accessories forming complete Unit. Suitable to give its full output at steam pressures between 120 and 200 lbs. per sq. inch. NEW 1925. For sale cheap, direct off site at Leatherhead.

Apply:—
GEORGE COHEN, SONS & CO., LTD.,
Wood Lane, Shepherd's Bush, W.12. 2122

JOHN CASHMORE, LTD.

We carry a large and Varied Stock of
A.C. and D.C. MOTORS.
All machines reconditioned before despatch.
Please send your enquiries.
EAGLE WORKS,
GREAT BRIDGE, STAFFS. 1436

ELECTRIC MOTORS AND DYNAMOS.

WE hold one of the largest Stocks of New and Second-hand Motors. Second-hand machines are thoroughly overhauled. Inspection and Tests can be made at our Works.
For Sale or Hire. Send your inquiries to:—
BRITANNIA MANUFACTURING CO., LTD.,
22-23, BRITANNIA STREET,
CITY ROAD, LONDON, N.1.
Telephone: 5512-3 Clerkenwell. 13

GREENHALGH BROS.
Atherton, near Manchester.

'Phone: Atherton 117.

130-kVA, 400 volts, 3-phase, 50 per., 600 revs. ALTERNATOR by Crompton & Co., three-bearing type with overhung exciter (new condition).

250-kW STEAM DRIVEN ALTERNATOR, Browett-Lindley, Vertical high-speed engine coupled to Mather & Platt Alternator, 400/440 V, 3 ph., 50 per., 375 revs.
(Both in excellent condition.) 5

KESSEL (POWER PLANT), LTD.,
FOR
REPAIR—OVERHAUL—TEST
OF
OIL, STEAM, GAS PLANT.
HEATHER PARK DRIVE, WEMBLEY. 2117

FOR SALE.—*Continued.*

Advertisements are inserted in this section at 1s. 9d. per line per insertion.

A 20-ton stock of Surplus Instrument and Resistance Wires, low prices.—London Electric Firm, Croydon. 1806

A 50-ton stock Carbons, every size and type, including battery. Low prices.—London Electric Firm, Croydon. 1640

A.C. Motor, 150 h.p., Siemens, 440/3/50, 750 r., S.R., 3 bearings, with starter.—Box 2115, c/o The Electrical Review.

AMMETERS, Voltmeters, House Service Meters (quarterly and prepayment), a.c. and d.c., all guaranteed one year; low prices.—The Victa Electrical Co., 47, High Street, Battersea, S.W.11. 'Phone: Batt. 0780. 8072

AERIAL Cables, all sizes quoted for low prices.—Edwardes Bros., 20, Blackfriars Road, London. 9845

B.A. Brass rolled screws, 5 and 6 by ¼ in. Ch., 6 by ⅞ in. Cak. Cheap.—Dorvick, 6, Station Parade, Balham, S.W.12. 9856

BEST English Cables, 19/.044, 19/.052, 19/.064, 19/.072, 19/.083, 37/.064, and all sizes up to 127/.103, new V.I.R. taped and braided, guaranteed quality, exceptionally low prices.—Edwardes Bros., 20, Blackfriars Road, London. 9846

BOOSTER on truck, input 100 volts, output 125 amps., 2/5 volts.—Gerber & Co., Ltd., 15, Moorfields, London. 2116

CRUDE Oil Sets. 68 kW, 115 kW, 400/3/50; 40 kW, 60 kW, 230 V; 40 kW, 60 kW, 460 V d.c.; Kohler Sets, 800 W, 1,500 W, 2,000 W.—Binns, 156a, Falsgrave Rd., Scarborough. 9835

E.B.L. Braided Cables, E.B.L. Tough Rubber Cables, E.B.L. Lead Covered Cables are reliable, low priced, and fully guaranteed. Price list.—Edwardes Bros., 20, Blackfriars Road, London. 9847

EDISWAN 30cwt. Nickel Battery Trucks, platform 5 ft. by 3 ft., rubber tyres. £30 each.—Urquhart, 58, Defoe Road, S.W.17. 2127

ELECTRICAL Accessories for house, factory and outdoor use, everything from the mains to the lampholder, including lamps, at lowest prices; all goods guaranteed.—Edwardes Bros., 20, Blackfriars Road, London. 9848

H.T. Testing Transformer, 100 kV, from 400 V, 50 cycles. As new; recent design; no longer required.—Box 2118, c/o The Electrical Review.

INSTRUMENTS for all purposes. Amps, Milliamps, Microamps, Volts, Millivolts, Ohms and Megohms, all accurately measured by the 50-range "Dix-Onemeter." A compact moving coil, Precision Fault Locator, 55/-. Type "S" Valve Analysers. Panel has M.C. Meter with rectifier for A.C. All ranges. Adaptor on cable and prods. Fully guaranteed, £5. A.C. Rectifier and Charges for change-overs. Switchgear and autos made to customers' specification.—Leslie Dixon Switchgear Co., 218, Upper Thames Street, E.C.4. 4964

LEAD Covered and Armoured Cables, P.I. and V.I.R. various, special lines at low prices.—Edwardes Bros., 20, Blackfriars Road, London. 9849

NAMEPLATES, Engraving, Diesinking Stencils, Steel Punches.—Stilwell & Sons, 153, Far Gosford St., Coventry. 14

ONE 4-cylinder Stationary Marine Engine, 28 break H.P., petrol paraffin, complete with baseplate flexible coupling. Series No. E1514/3333. Hunt & Co. (Newark), Ltd., 26, Stodman Street, Newark-on-Trent. 2109

PICKLING Cradles. Solid Unit.—Designers and Manufacturers, Williams Alexandra Foundry, Ltd., Cardiff. (Send for catalogue.) 1940

POWER Factor Correction.—80 h.p. "KOSFI" slip ring A.C. Motor by English Electric, 745 revs, 400 volts, 3 phase, 50 cycles; Brookhirst starter. In stock.—Thomas Mitchell & Sons, Ltd., Bolton. 2078

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PATENTS and Designs Acts, 1907 to 1932. Notice is hereby given that The General Electric Company, Limited, of Magnet House, Kingsway, London, W.C.2, and John Walter Ryde and John Turton Randall, both of Research Laboratories of The General Electric Company, Limited, Wembley, Middlesex, seek leave to amend the Specification of the Application for Letters Patent No. 463299 for an invention entitled "Improvements in or relating to electric circuit arrangements for electric discharge devices." Particulars of the proposed amendment were set forth in No. 2527 of the Official Journal (Patents), published on June 23rd, 1937. Any person, or persons, may give Notice of Opposition to the amendment by leaving Patents Form No. 19 at the Patent Office, 25, Southampton Buildings, London, W.C.2, within one calendar month from the date of publication of the said journal.—M. F. LINDLEY, Comptroller-General. 2126

PROPRIETORS of an Invention designated "The Lewis Electric Switch Beacon" (patents applied for) are prepared to negotiate and also consider offers for the development and production of this device.—Reply to H. D. Fitzpatrick & Co., 49, Chancery Lane, London, W.C.2. 2072

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GOVERNMENT'S ELECTRICITY PROPOSALS.

Dealing with the McGowan Report, the chairman said that with the main purport of that report, which was the unification of electric supply, he had nothing to say, but he had something to say about the proposals, because, if they were carried out, many thousands of pounds' worth of assets would meet with confiscation. No doubt some objection might be taken to that word, but it was near enough for him and, if stockholders looked at the facts, he thought it would be near enough for them.

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Further than that, the present efficient management of the various electricity undertakings was to be scrapped and the management in future would be appointed by the Minister of Transport in consultation with the Local Authorities. That could only mean jobbery, and jobbery meant inefficiency, and inefficiency meant that in the end they would have to pay more for their electricity, which, however, did not bother him that day.

They were anxious. They had lost Mr. Baldwin and they had trusted Mr. Baldwin, but after the N.D.C. mess-up they had to reserve their opinion about Mr. Chamberlain. He was sorry to have to bother stockholders with politics, but it was a matter which somewhat deeply concerned them. However, they were not downhearted, and in these times it did not do to look too far forward; so, taking only the present year, they felt satisfied that they would have an increase and that that increase would be large enough to cover what they had to pay under the new duty.

The report was unanimously adopted. 2100

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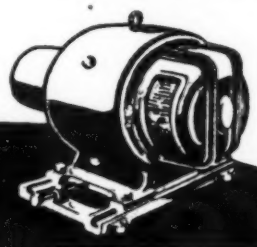
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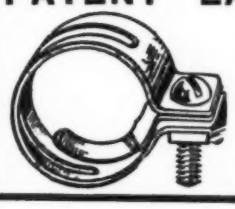
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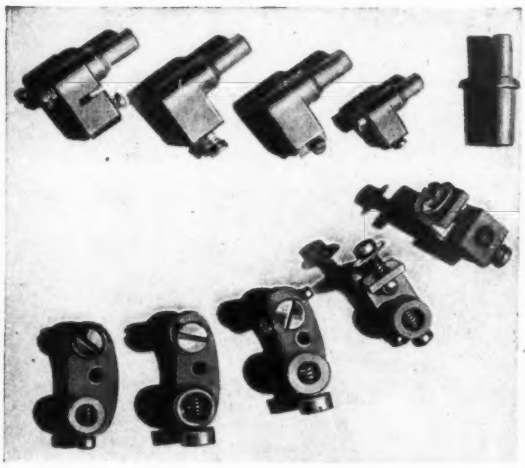

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We shall be pleased to arrange for you to visit the "Davenset Equipped Cinema" nearest to your office. Just write to us.

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KANDEM FLOODLIGHT PROJECTORS are EFFICIENT EFFECTIVE INEXPENSIVE AND ROBUST

No. 12 Wide Beam 1,000 watt Floodlight

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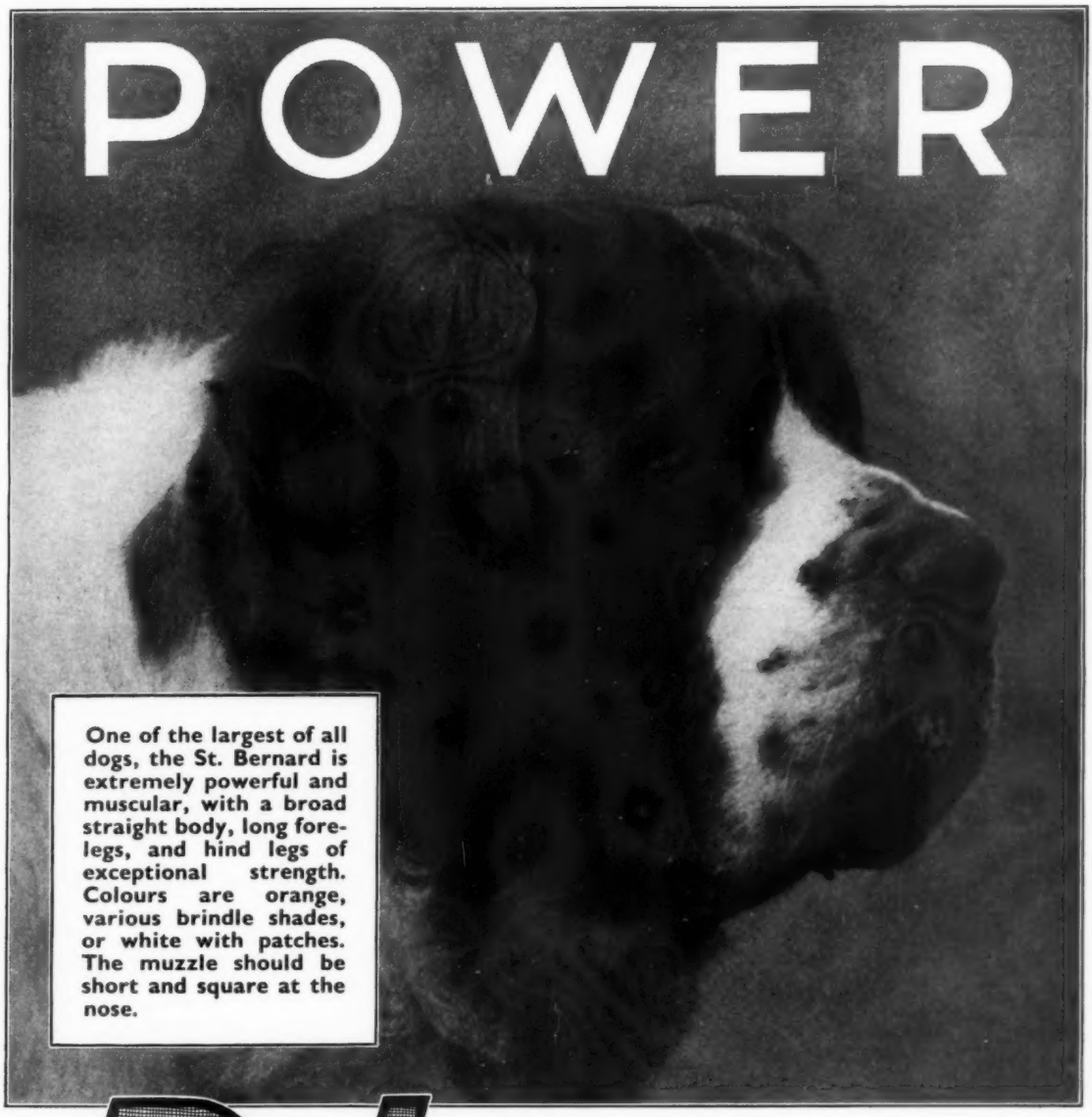
POWER



One of the largest of all dogs, the St. Bernard is extremely powerful and muscular, with a broad straight body, long fore-legs, and hind legs of exceptional strength. Colours are orange, various brindle shades, or white with patches. The muzzle should be short and square at the nose.

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The power which has to be handled by electric cables has increased enormously in the last twenty years, but as voltages have risen research and skill have always produced a reliable B.I. CABLE to meet requirements. At the present time there are in service nearly 1,000 miles of B.I. CABLES for 33 kV. and 66 kV. working pressure. Of these B.I. CABLES over 270 miles carry the higher voltage, and 128 miles are of the oil-filled type.

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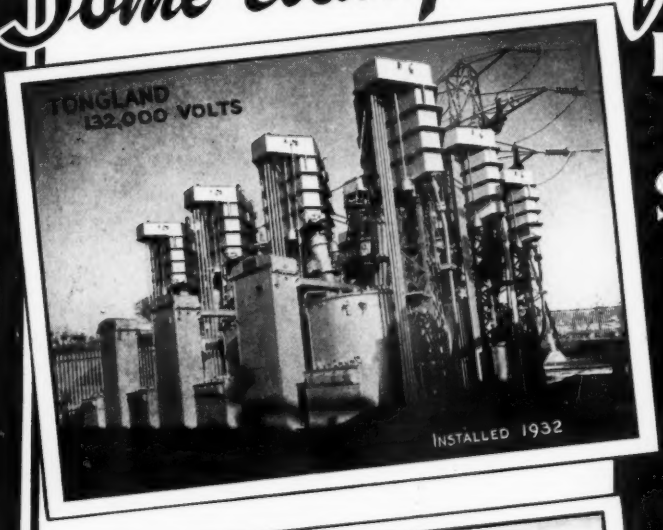
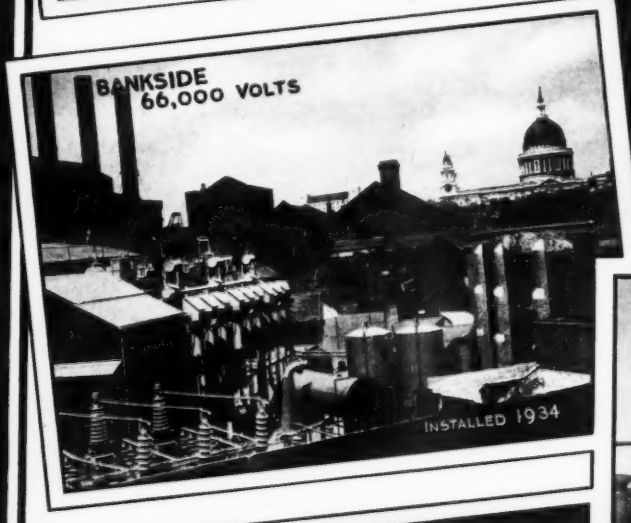
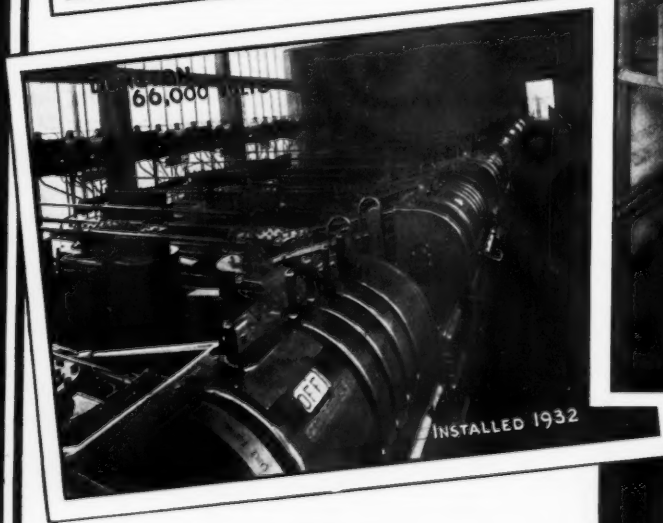
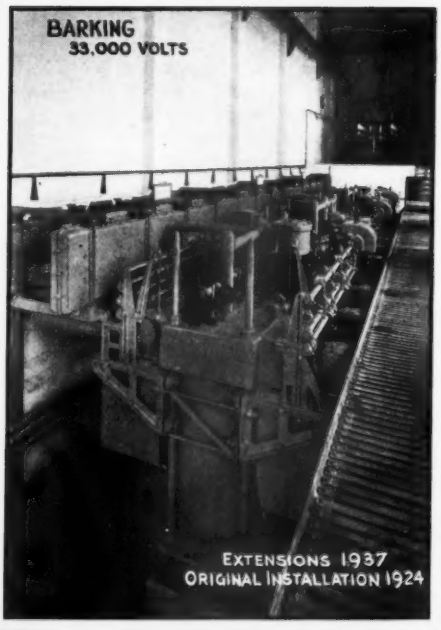
Some examples of

LARGE HIGH-VOLTAGE METAL-CLAD SWITCHGEAR









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Truck transport costs less per load when the batteries are by FULLER

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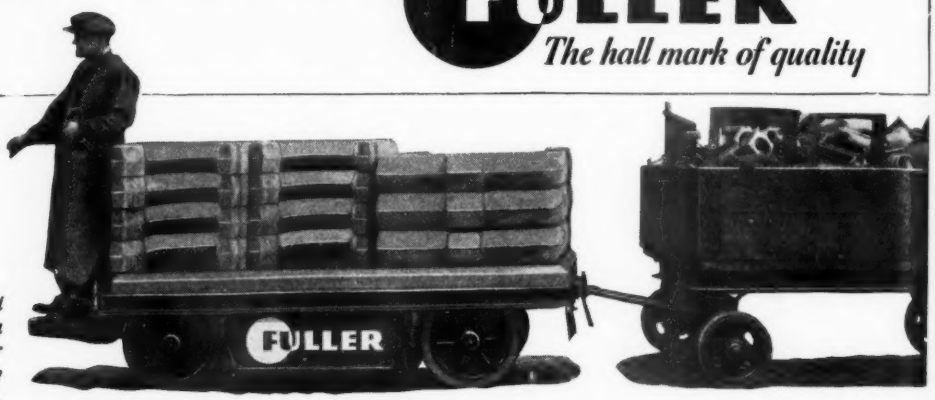

An Electric Truck powered by Fuller Batteries hauls a heavy load at the boiler works of Messrs. Hartley & Sugden Ltd., Halifax.

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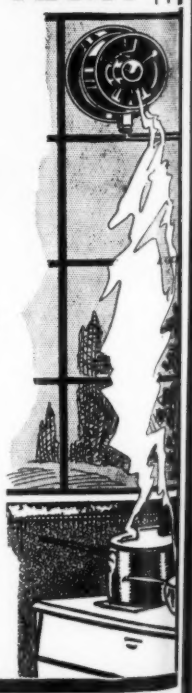

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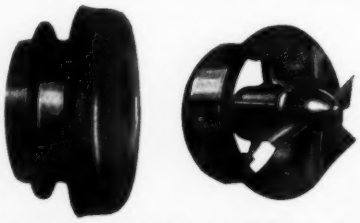

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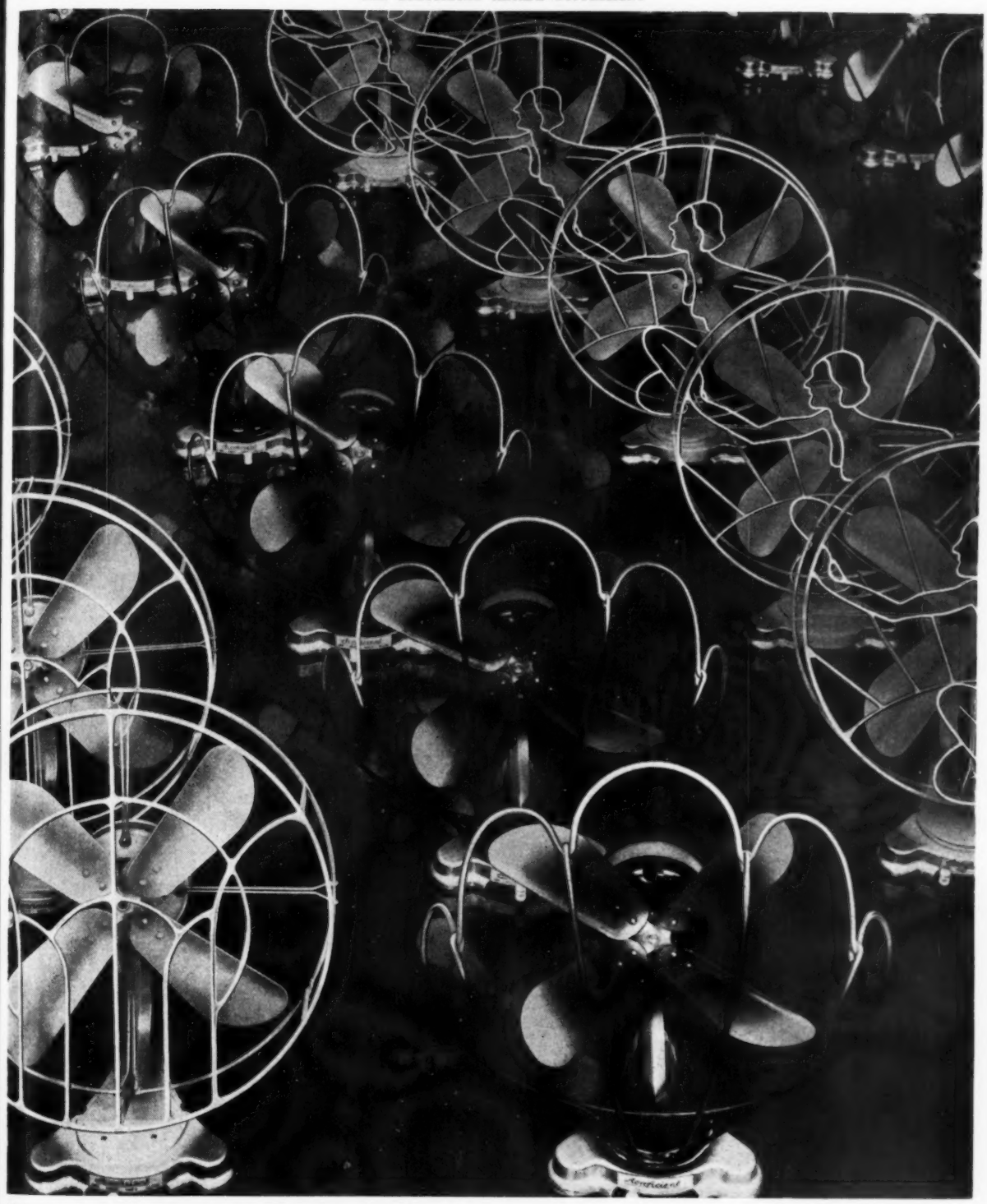

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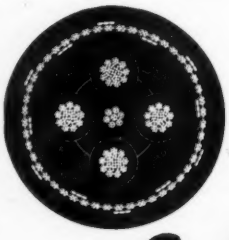

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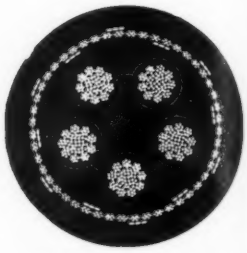
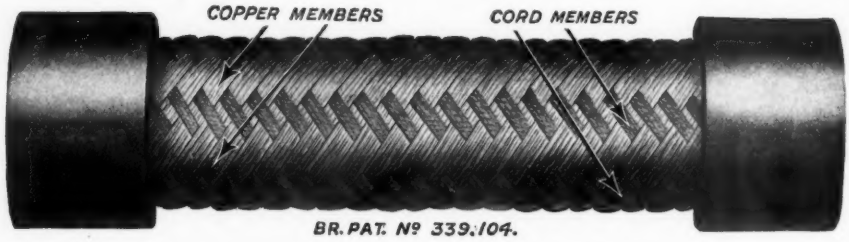
(Safety First)





BR. PAT. Nº 339,104.

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(As recommended in the Reports of H.M. Electrical Inspector of Mines)

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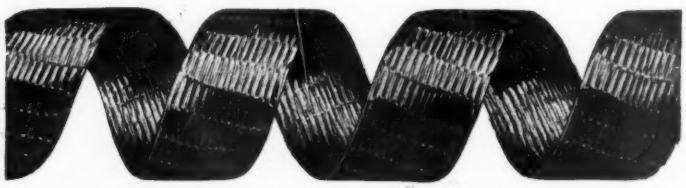

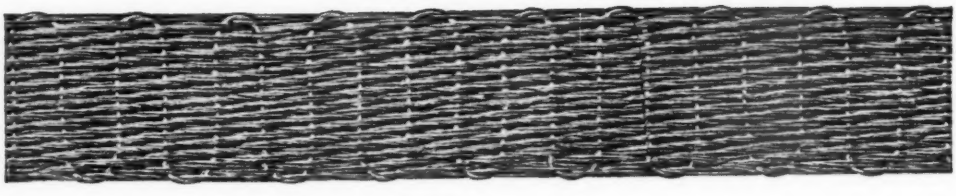

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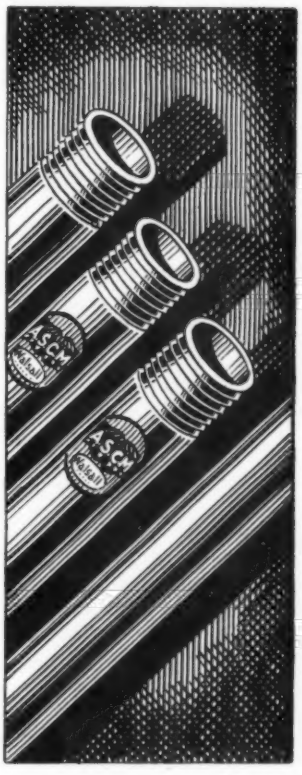

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No danger from sudden darkness with

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THE AUTOMATIC EMERGENCY LIGHTING SYSTEM

for Hospitals, Ships, Hotels, Theatres and all Business and Public Buildings

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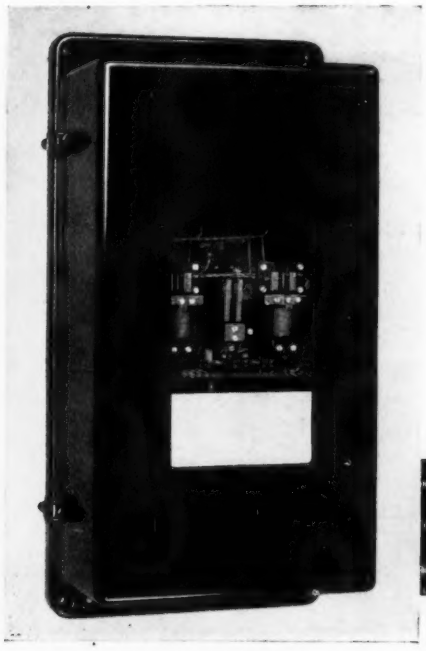
SIEMENS

High Speed Automatic Synchronising Equipment



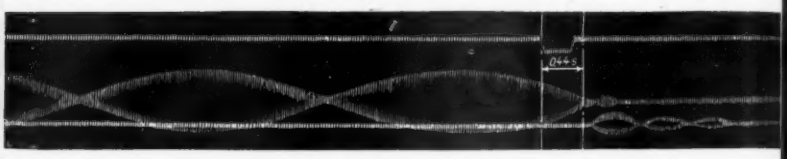
will, independent of any difference in the frequencies of the two systems to be synchronised, give a switch closing impulse an instant in advance of phase coincidence equal to the time required for the circuit breaker to close.

Synchronisation can be carried out even with a slip of 1 per cent., i.e. when at a frequency of 50 cycles the synchronoscope makes one complete revolution in two seconds. Synchronisation is, therefore, carried out extremely quickly since it is not necessary to match the frequencies.

The Siemens Automatic Synchronising Equipment is, therefore, an important help in order to ensure quick and positive coupling of supply systems with a minimum current surge or when switching spare units on to the busbars.

Further particulars on application.

Circuit breaker closing time.
Closing impulse of circuit breaker. Circuit breaker closed.



Frequency 52 cycles. Voltage 11 KV. Slip approx. 0.7%
Error approx. 1°.

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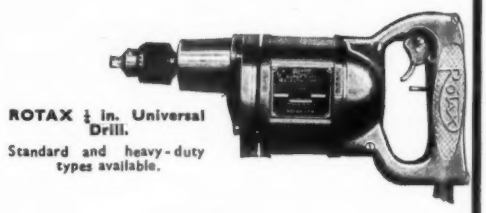
Safety switch protects operator from shock.

Users of ROTAX Equipment are assured of quality backed by service which is second to none.



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A heavy-duty powerful tool for continuous work

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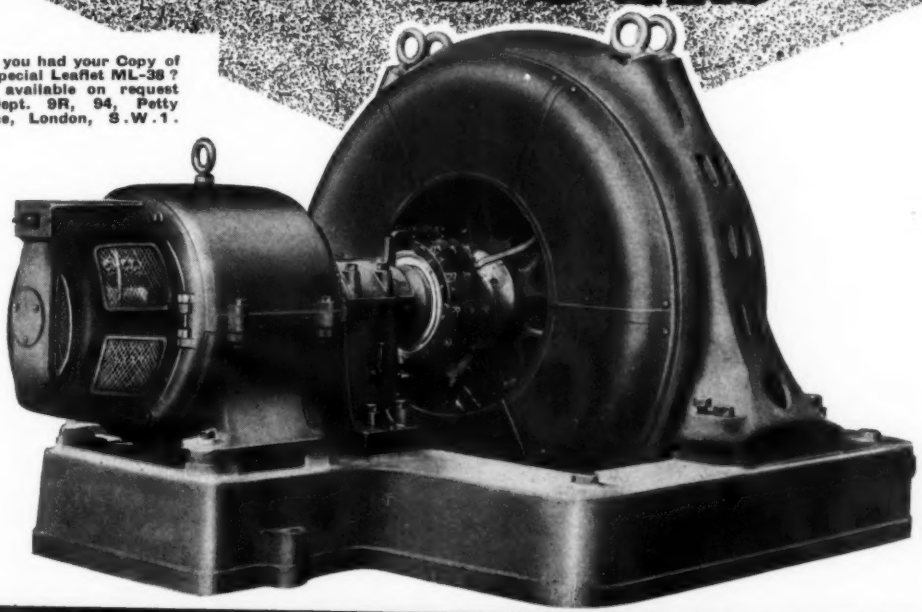

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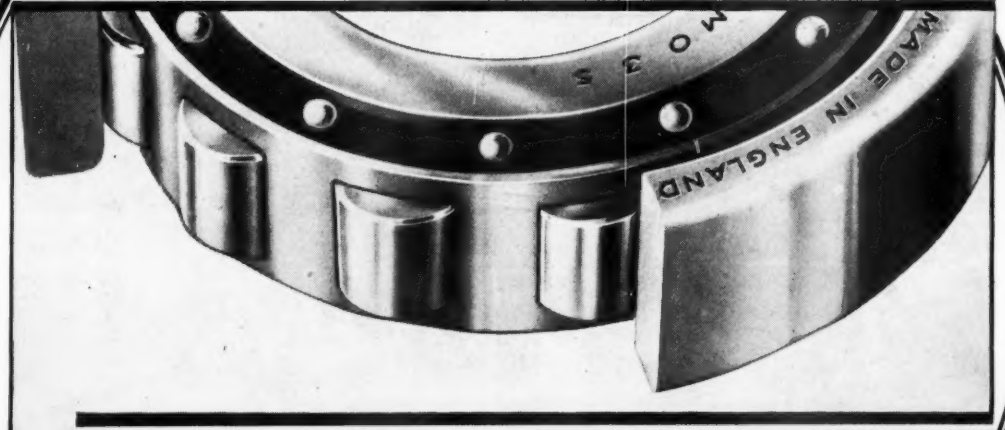

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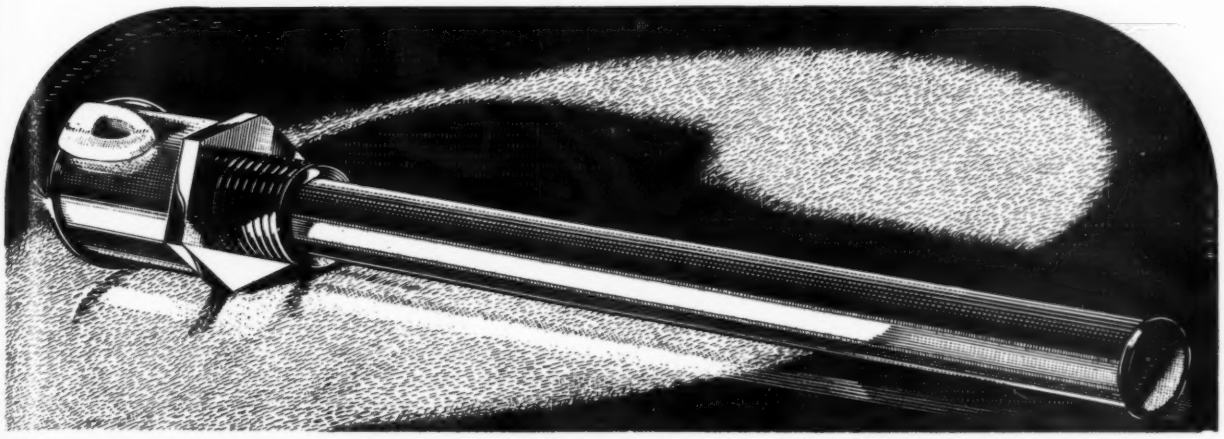

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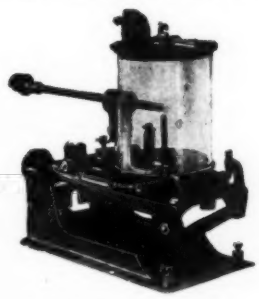

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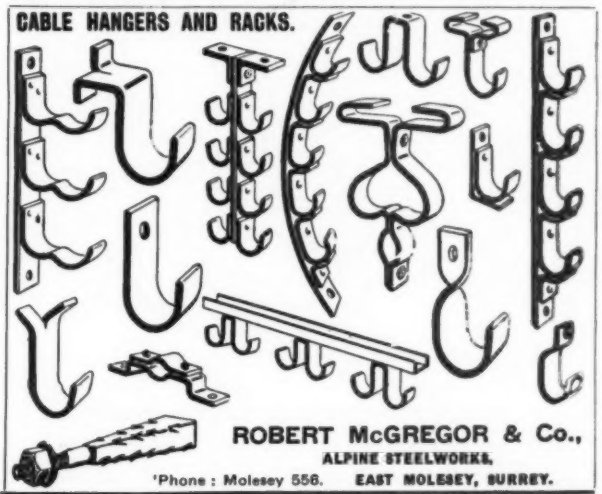

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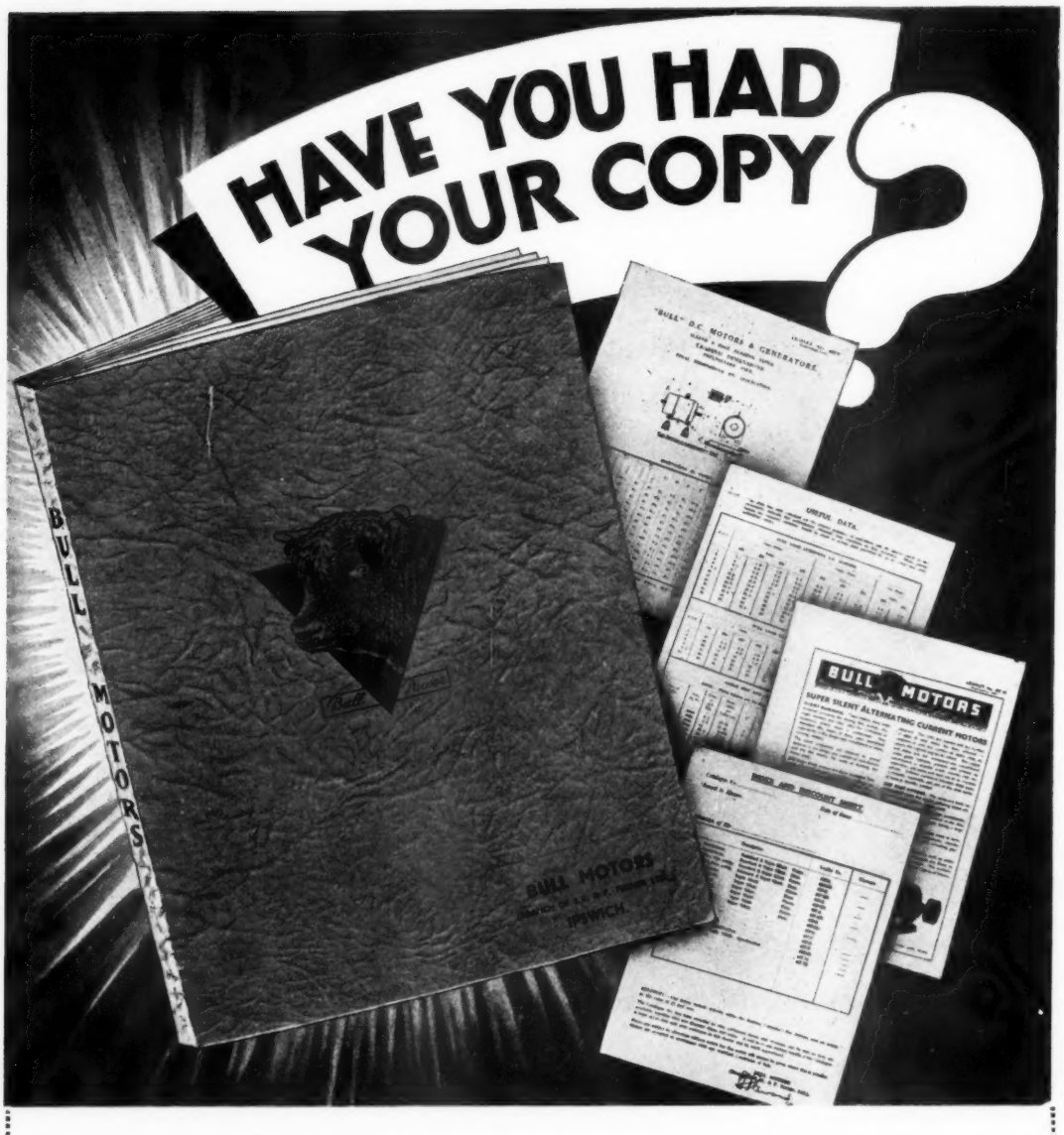

THIS publication, containing technical data, specifications, dimensions and prices, forms a complete guide to the selection of A.C. and D.C. machines. If you are on our mailing list your copy will have been posted, but to ensure that you receive this, together with future publications, personally, use the attached form or merely send a request on your business heading. You will probably appreciate how helpful It is to us if you mention this journal when writing.

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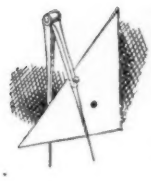

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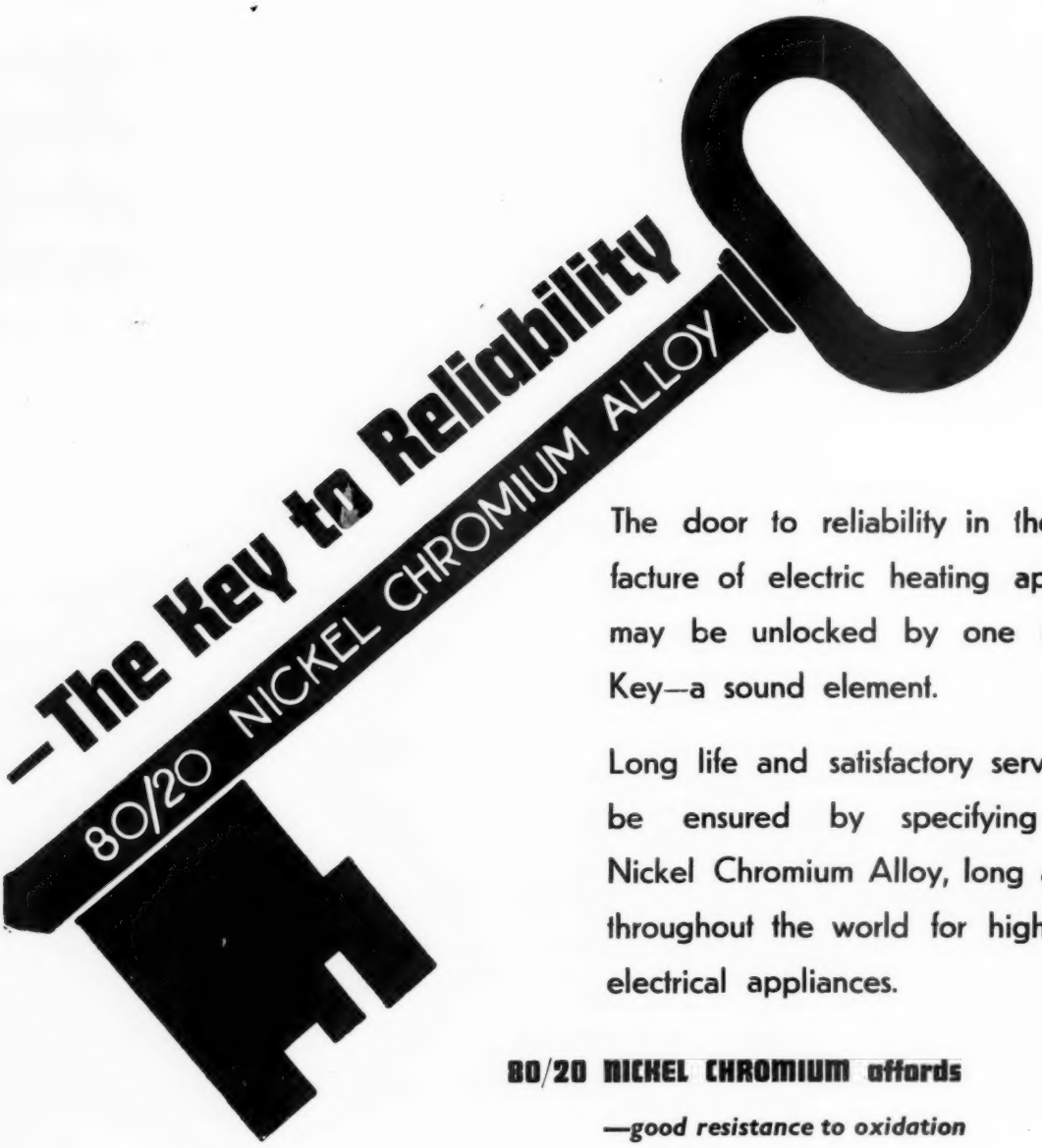

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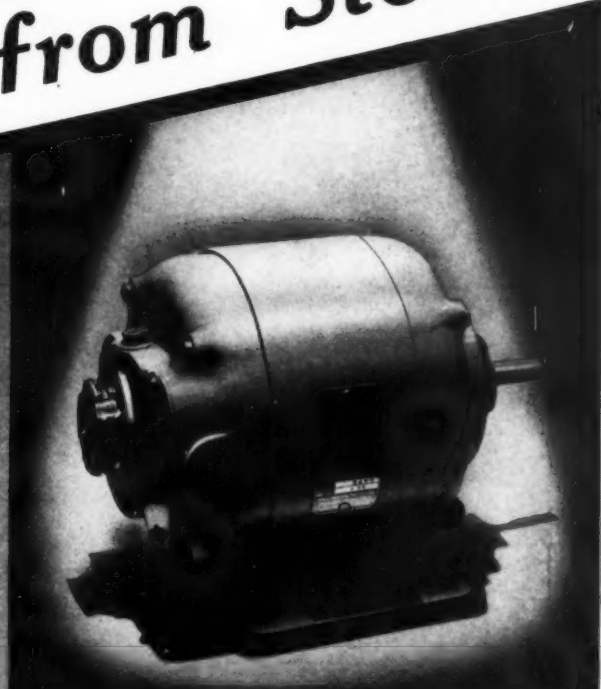

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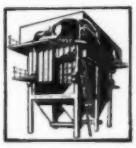

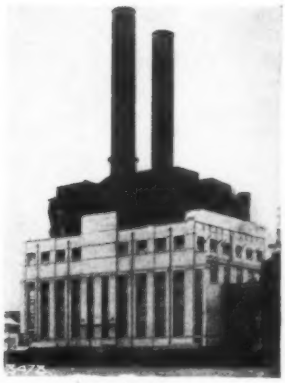

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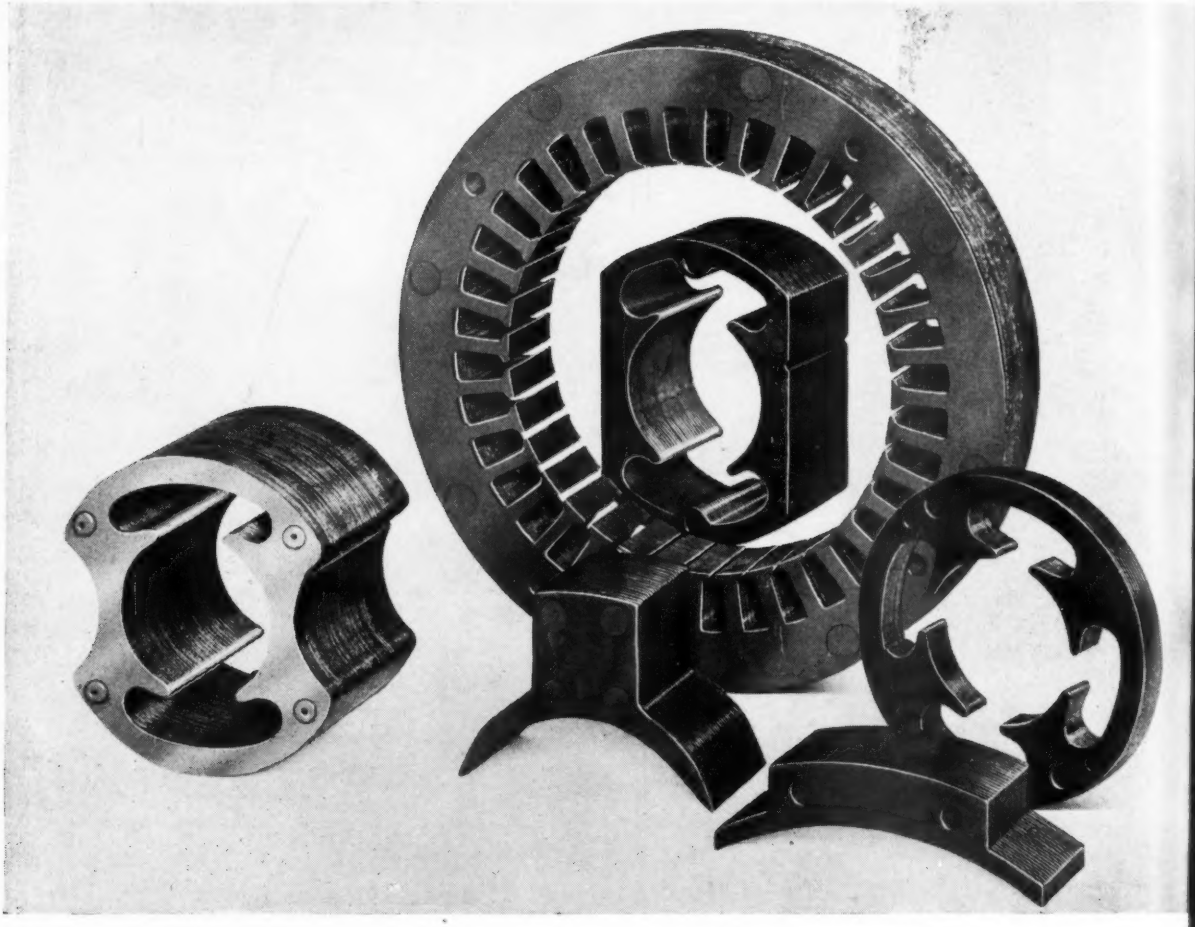

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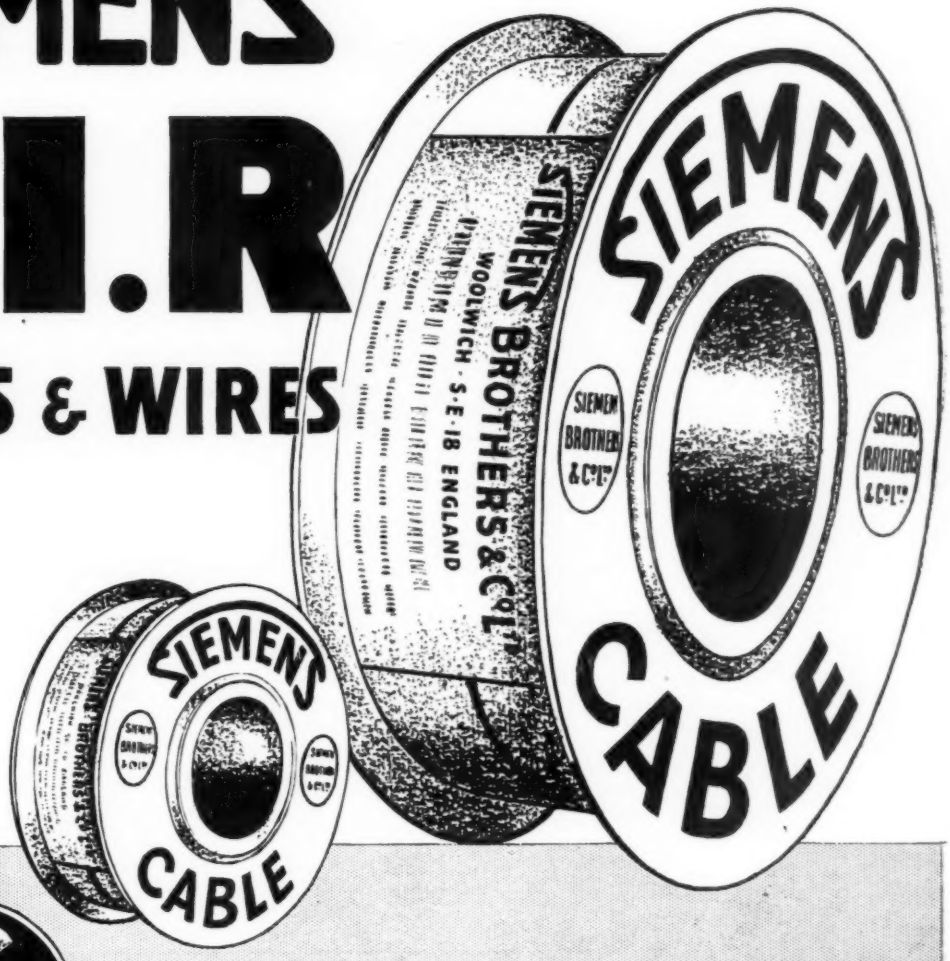

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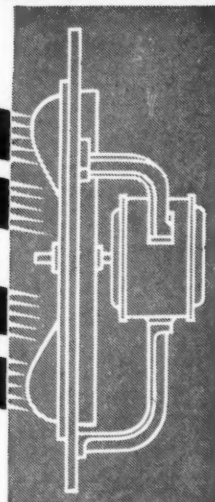

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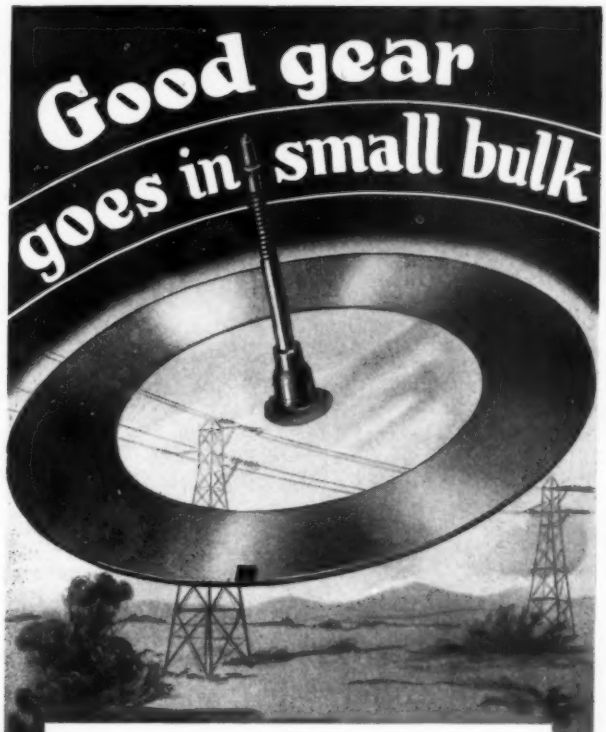

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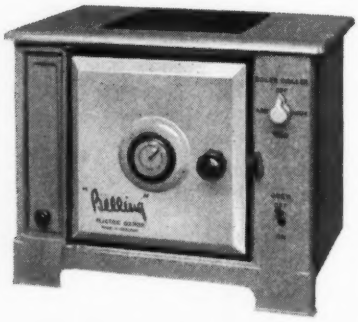

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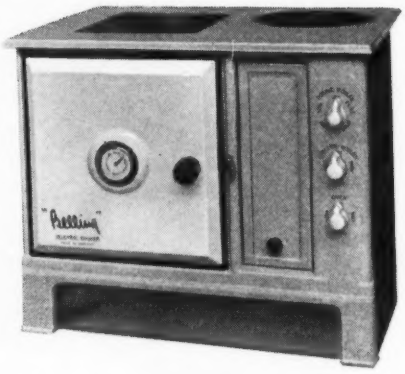
LOADING — Boiler - Griller 2,000 watts.
Oven 750 watts.
OVEN SIZE—11½"H × 11"W × 11¼"D.
OVERALL SIZE—15½"H × 19½"W × 13½"D.
Mottled Vitreous Enamelled Inside and Out.



LIST No. 40B COOKER
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LOADING — Boiler - Griller 2,000 watts.
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Oven 1,500 watts.
OVEN SIZE—12½"H × 13"W × 13"D.
OVERALL SIZE—20½"H × 24"W × 16"D.
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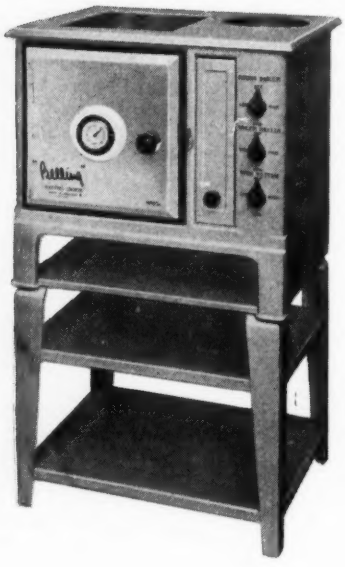
£5 . 19 . 6

LOADING — Boiler - Griller 2,000 watts.
Round Boiler 1,000 watts.
Oven 1,200 watts.
OVEN SIZE—11½"H × 12"W × 12½"D.
OVERALL SIZE—19"H × 21½"W × 15"D.
Mottled Vitreous Enamelled Inside and Out.



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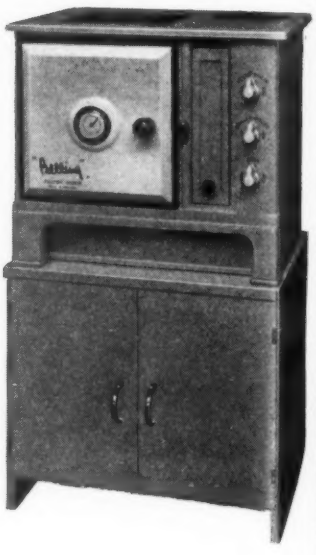

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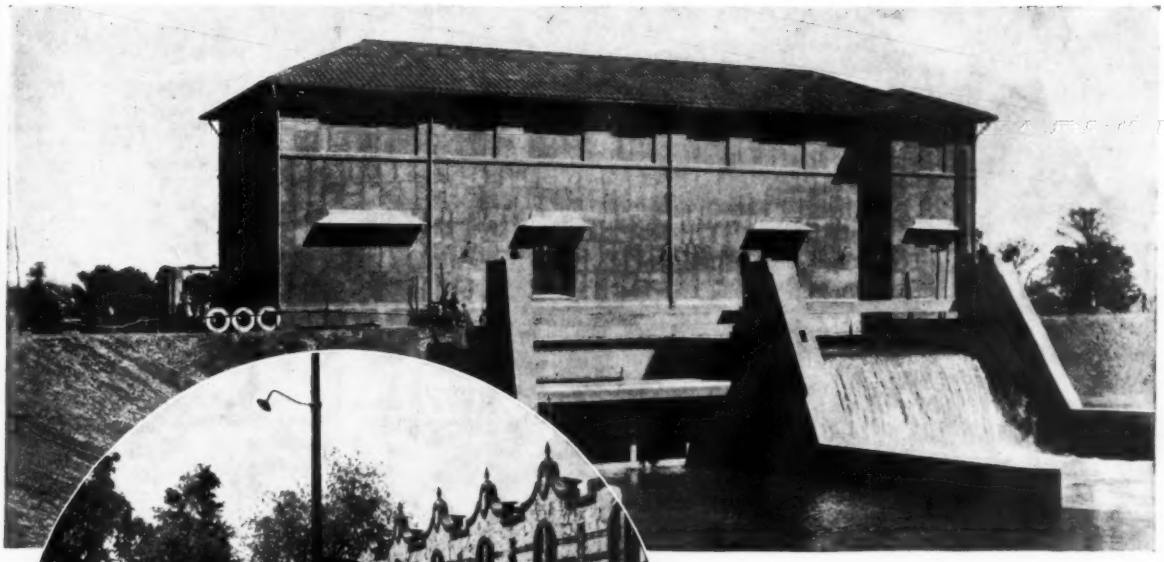

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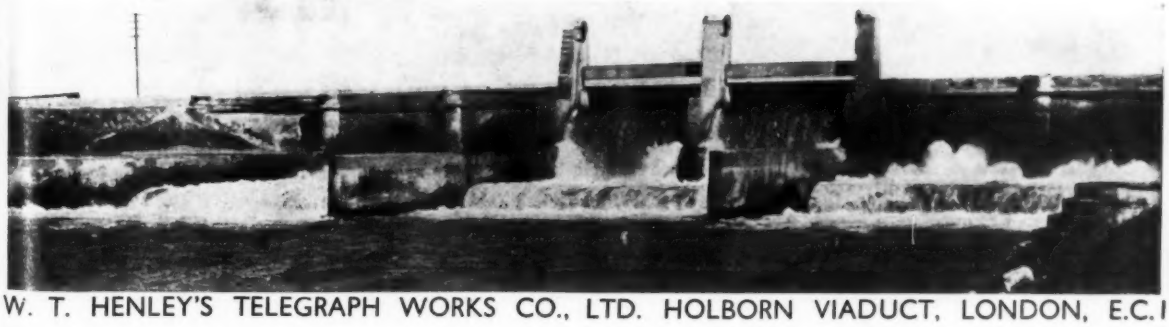

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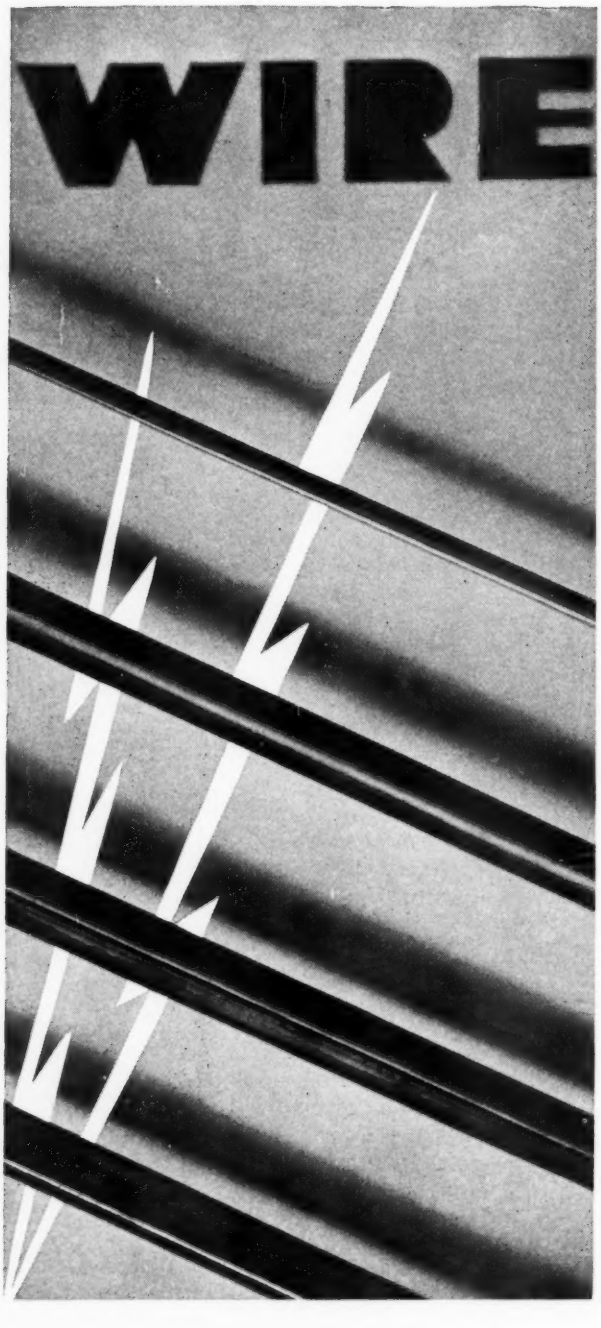

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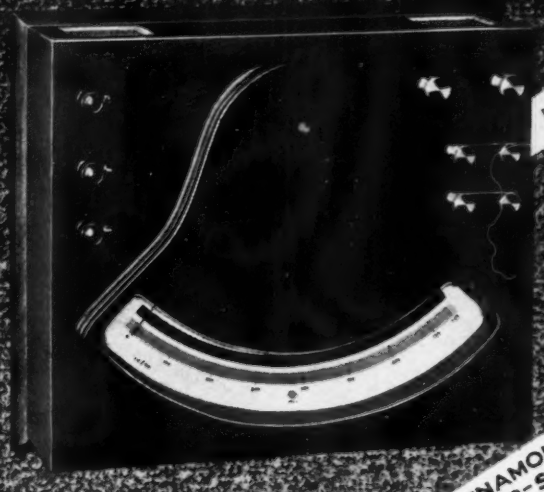

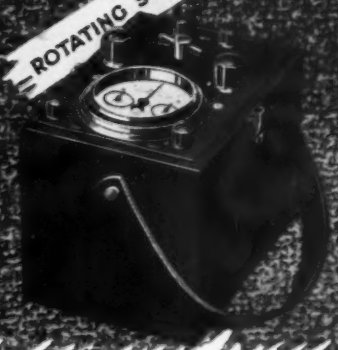

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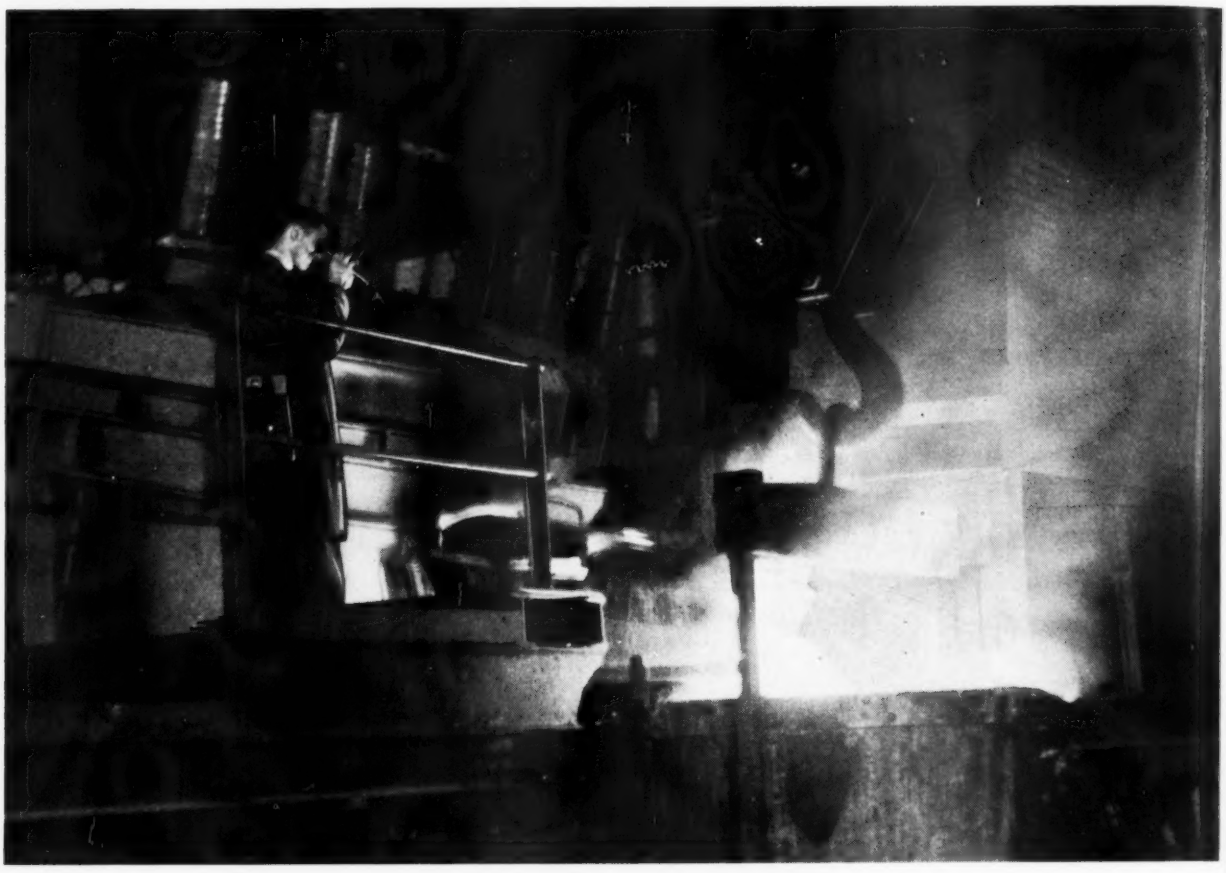

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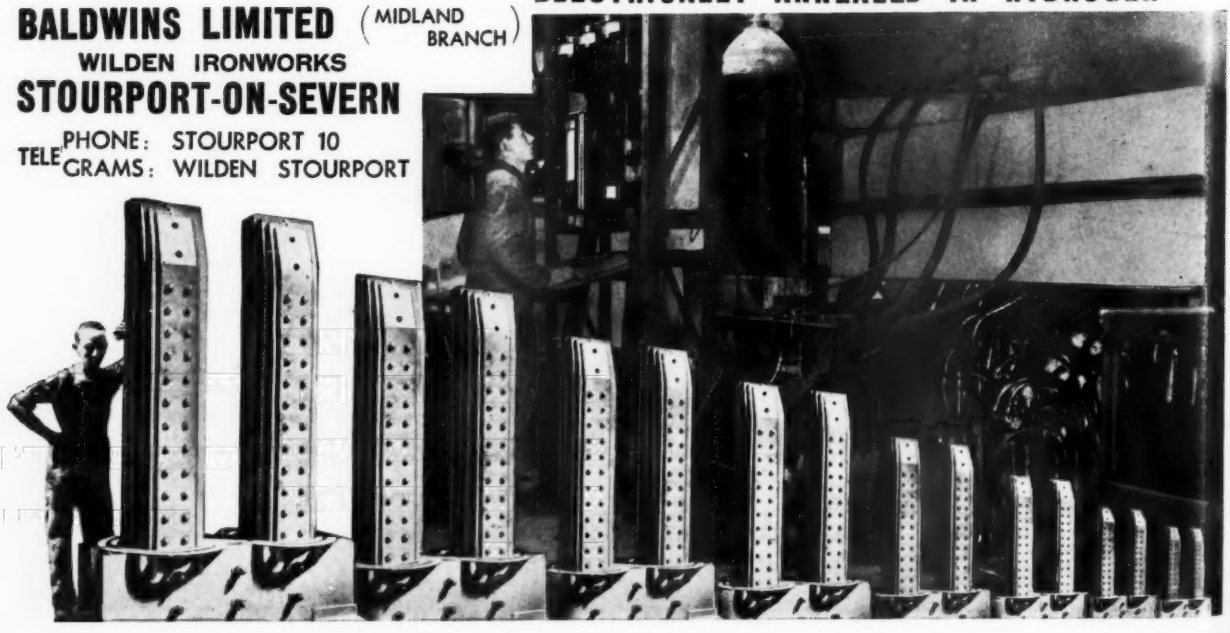

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4050 TYPE

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Anode voltage, 300 to 2,000 volts.

Normal anode voltage, 350 volts.

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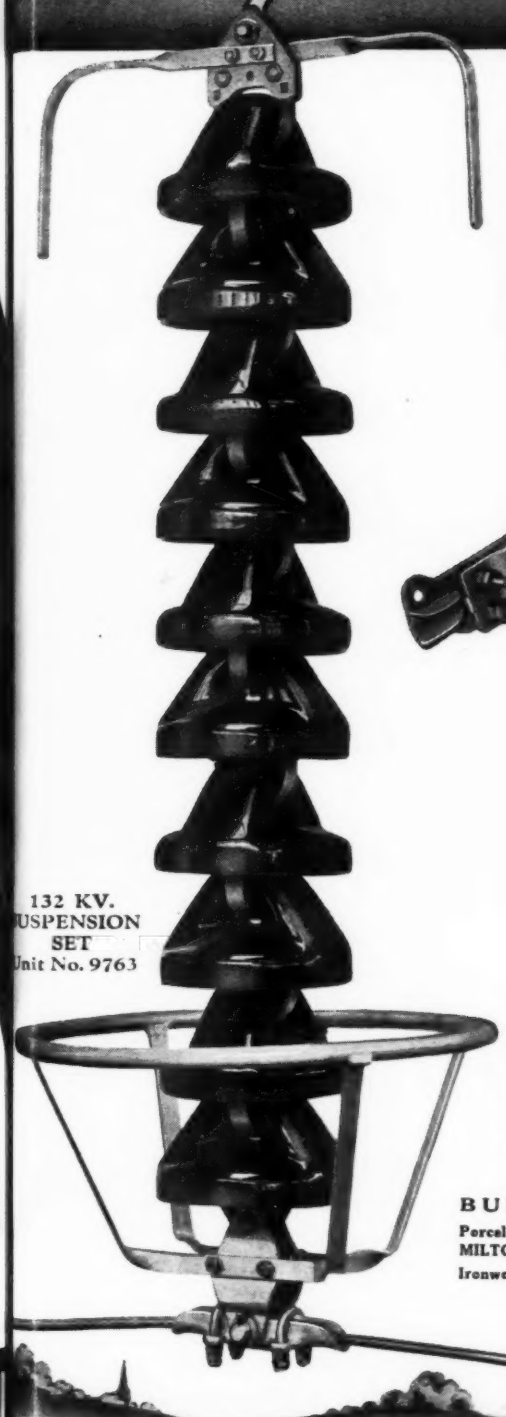
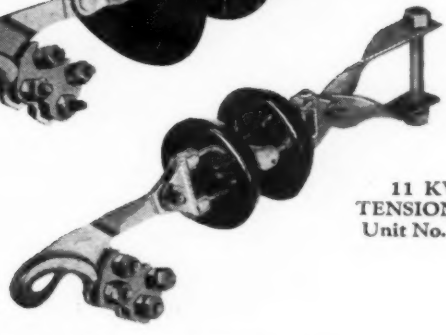


132 KV.
SUSPENSION
SET
Unit No. 9763

33 KV.
Heavy Duty
TENSION SET
Unit No. 7615

33 KV.
Normal
TENSION SET
Unit No. 3431



11 KV.
TENSION SET
Unit No. 3271

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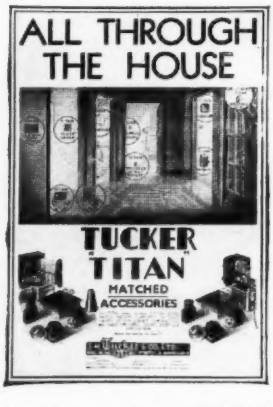
'Phone: Mansion House 9971 (3 lines).
'Grams: "Bullers, Cannon, London."

TUCKER "TITAN"



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WITH 15 AMP. SWITCH AND TWO 15 AMP. D.P. FUSES—OR 15 AMP. SWITCH AND TWO OR THREE 5 AMP. D.P. FUS

Easy wiring fuse units—Shielded terminals—Ample wiring space.
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Ideal for small lighting and power installations ▪ **Write for details to Dept.**

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KINGS RD. TELAC TYSELEY. BIRMINGHAM. 11

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ELLISON FLAMEPROOF LIGHTING EQUIPMENT

Even more powerful lighting with the NEW ELLISON 100 watt Lantern!

Ellison Flameproof Lighting Equipment has been tested by the Board of Trade Mines Department at Buxton.

Low pressure (125 volts) for underground lighting can readily be obtained from the med um pressure power mains through the Ellison transformer. Both power and lighting cables are easily connected through the cable end couplings which form part of the unit.

To provide even more powerful illumination for surface and underground lighting, Ellison's have designed this new 100 watt lantern for use with their Flameproof Lighting Equipment. It can be bolted to the same cable end coupling as the 60 watt lantern and may be connected to single end, two-way, or three-way assemblies. Two lanterns may be bolted to a straight through coupling.

The lantern has passed tests applied to apparatus at Buxton, for use in Methane, Petroleum, and Acetone Vapours and is strongly recommended for use in Collieries, Chemical Works, Petroleum Plants and, in fact, all situations where good lighting is required together with reliable, flameproof lighting fittings. Write to-day for interesting literature fully describing Ellison Flameproof Lighting Equipment.

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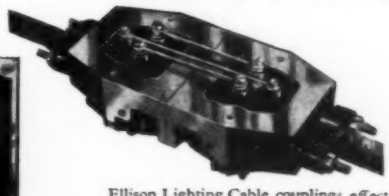

Ellison Lighting Cable couplings effect a considerable saving in time and cost of labour. They can be attached to lengths of cable before being taken to site and quickly coupled together by links.

323

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The original instrument with scale length equal to the dial diameter. Low power consumption. Sprung jewel suspension.

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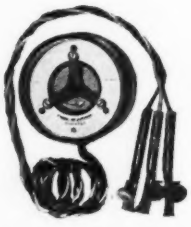

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for determining the sequence of phase rotation between conductors when connecting an instrument to a polyphase circuit.

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are designed to give warning of any gradual or sudden deterioration in the insulation of all kinds of L.T., A.C. and D.C. systems.

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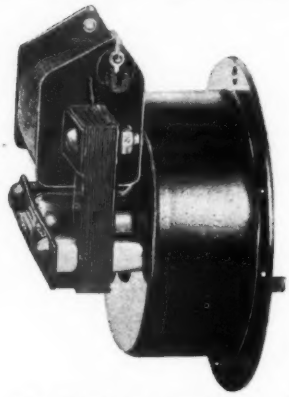
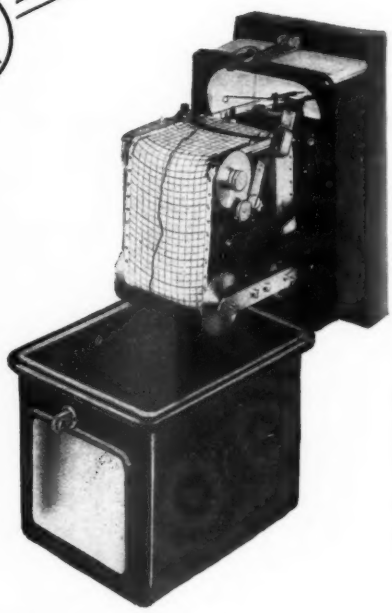
(WARRENS PATENT)

The original and still the best self-starting Synchronous Motor for every purpose where constant speed is essential.



The **SYNCLOCK MOTOR** is made in several sizes and there is no timing problem which cannot be solved by this means where a controlled A.C. supply is available.

- **Gearing runs in a sealed "OIL BATH."**
- **Instantaneously self-starting under load.**
- **It is truly synchronous.**
- **Unaffected by voltage or temperature variations.**
- **High torque with low power consumption.**
- **Light weight and compact unit consumption.**



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- The ink supply is self-adjusting.
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- Synchronised records on all graphic instruments assured by Synclock motor drive.
- They comply with British Standard Specification 90.
- 20 years' successful service throughout the world.

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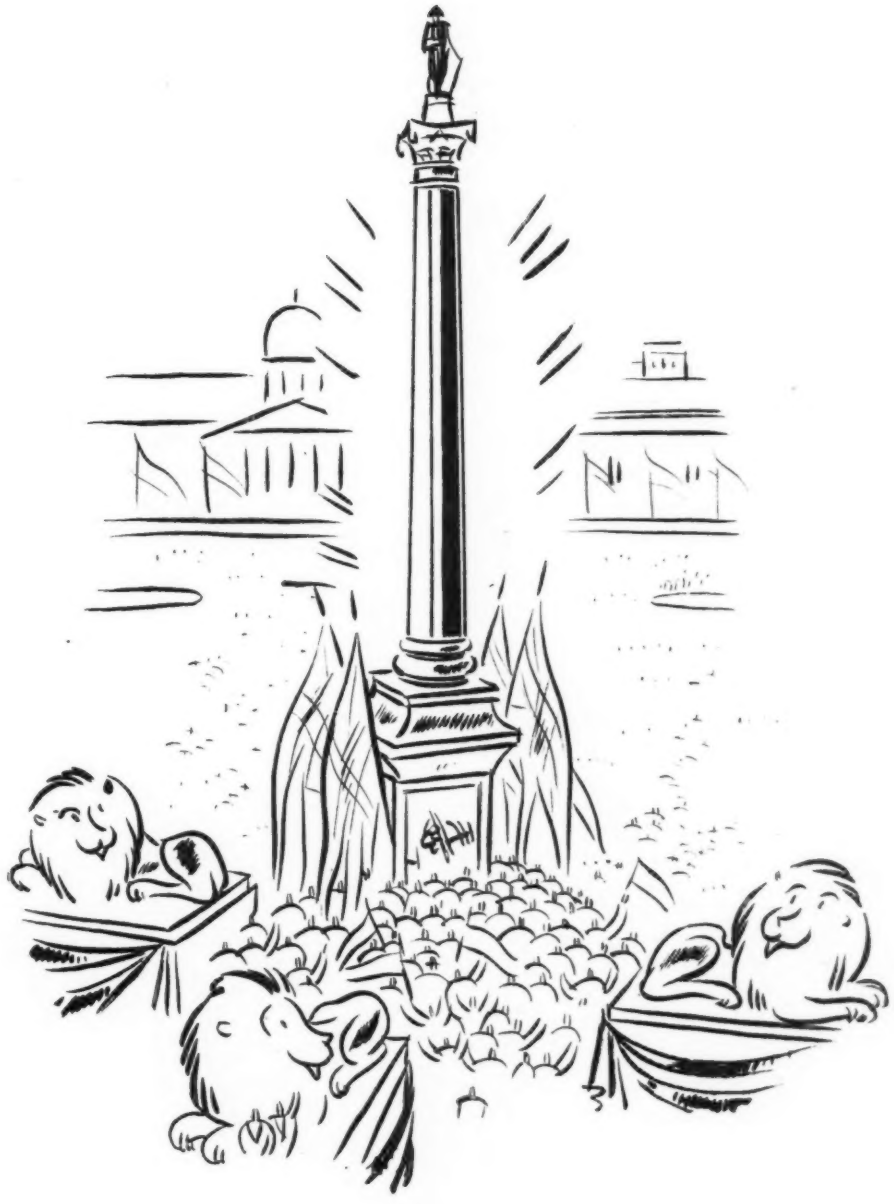

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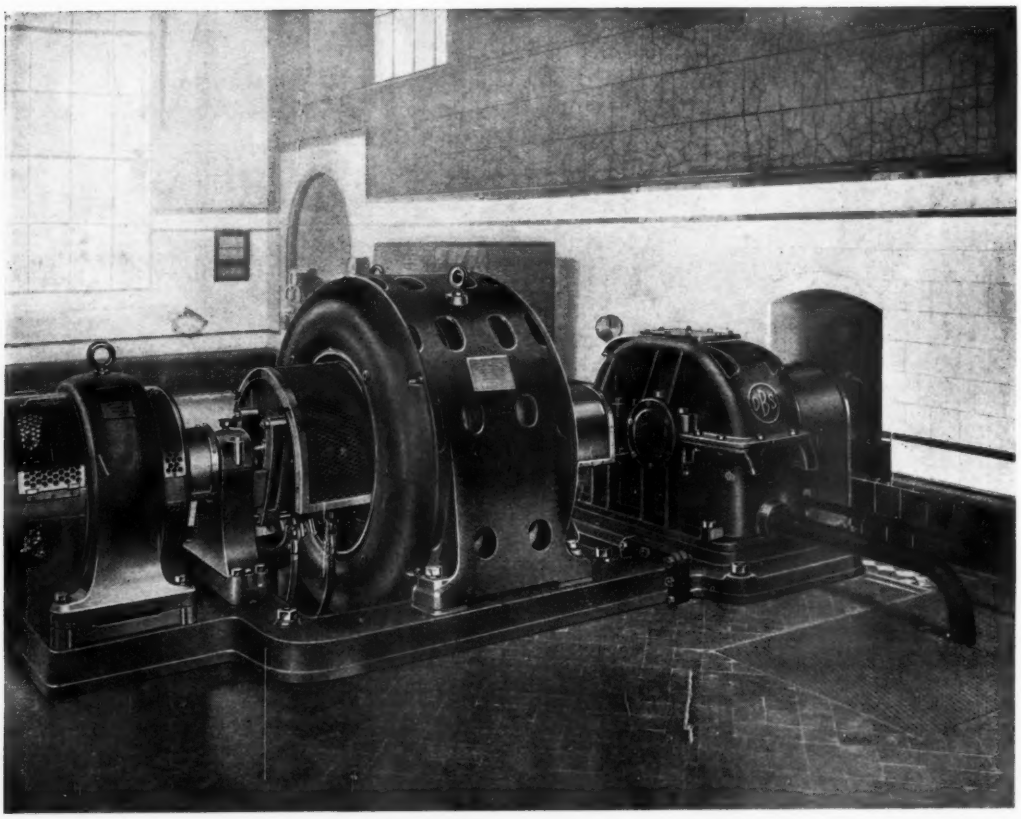
ELECTRIC-CONSTRUCTION

SYNCHRONOUS INDUCTION MOTORS

FOR

POWER-FACTOR CORRECTION



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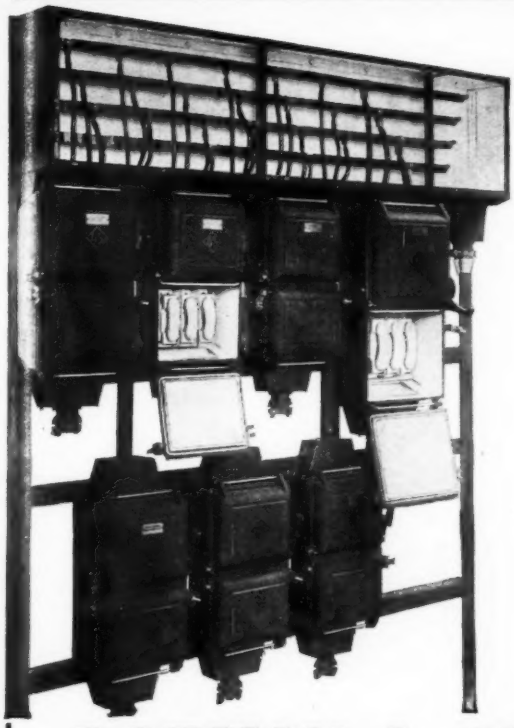

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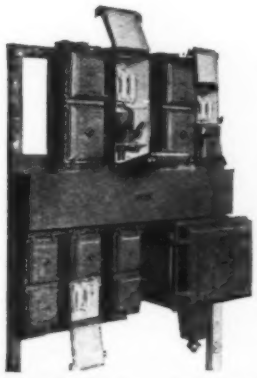

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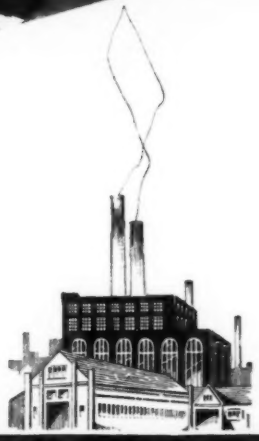

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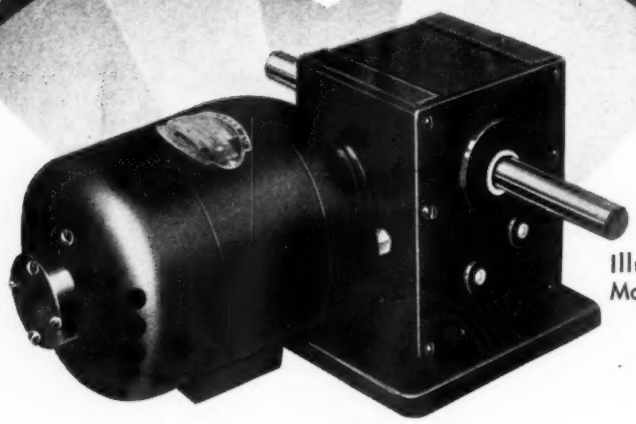

Illustrated is Model 1K-UGM.

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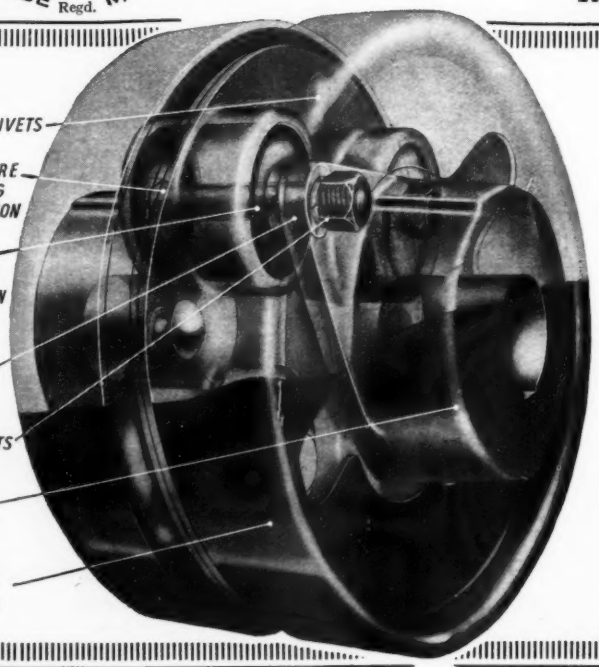
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This coupling absorbs a large amount of torsional vibration—shocks and uneven impulses.

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NALDERS

2 EXAMPLES OF N.C.S. INSTRUMENTS

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Illustration shows Type D, N.C.S. "Ideal" Synchroscope for paralleling alternators, with red, green and white signalling device and synchronising lamp. Indicates at once when the incoming machine is running at correct speed, or whether above or below, also its phase relation with respect to bus-bar E.M.F.

N.C.S. products include all types of Measuring Instruments (Indicating or Recording, Switchboard and Portable) Protective Relays, Synchronisers, Circuit Breakers (Air-Break pattern), Earth Leakage Trips, etc. Every unit is designed for maximum operating efficiency, reliability and durability, prices being competitive without the sacrifice of quality.

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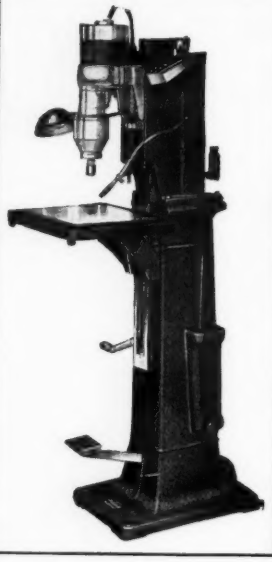

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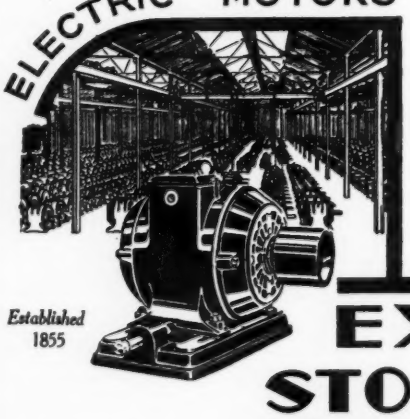

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1	925	4	1430	12½	1440
1	695	4	940	12½	950
1½	1420	5	1435	15	1440
1½	935	5	940	15	955
1½	695	5	715	15	725
2	1425	7½	1435	20	1445
2	935	7½	940	20	960
2	705	7½	720	20	725
3	1430	10	1440	25	960
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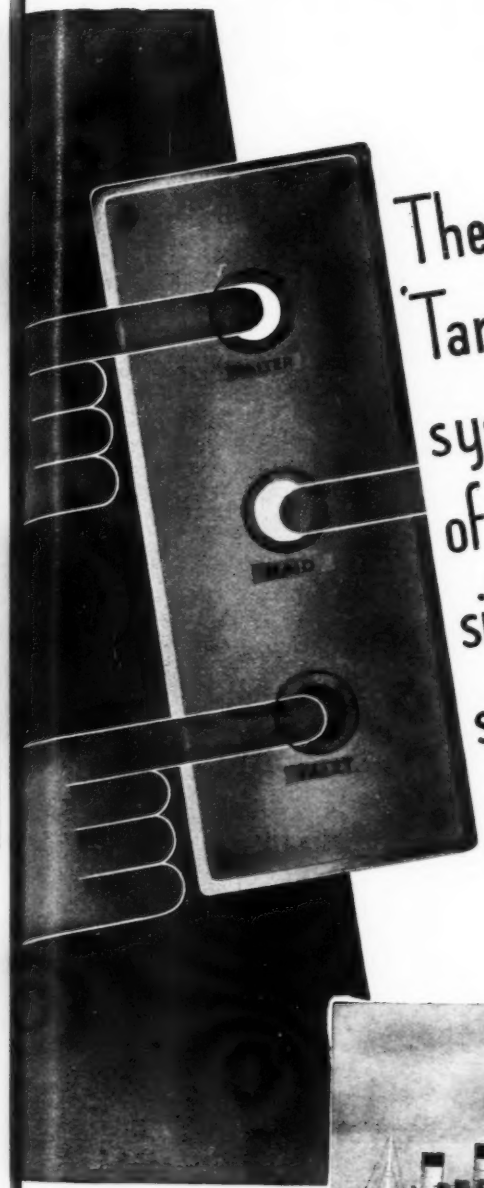

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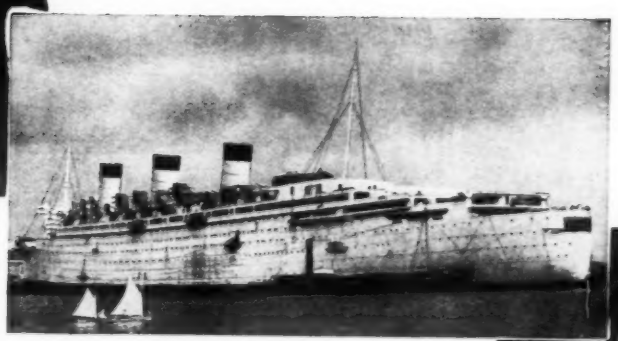

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For silent communication between guests and staff.

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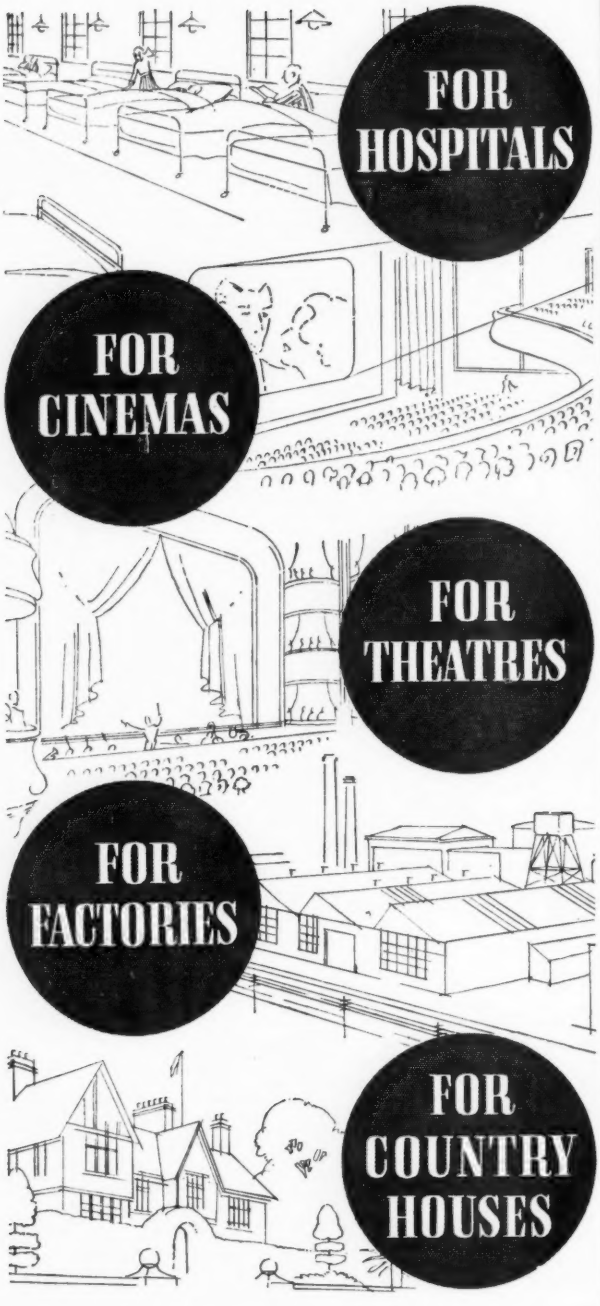

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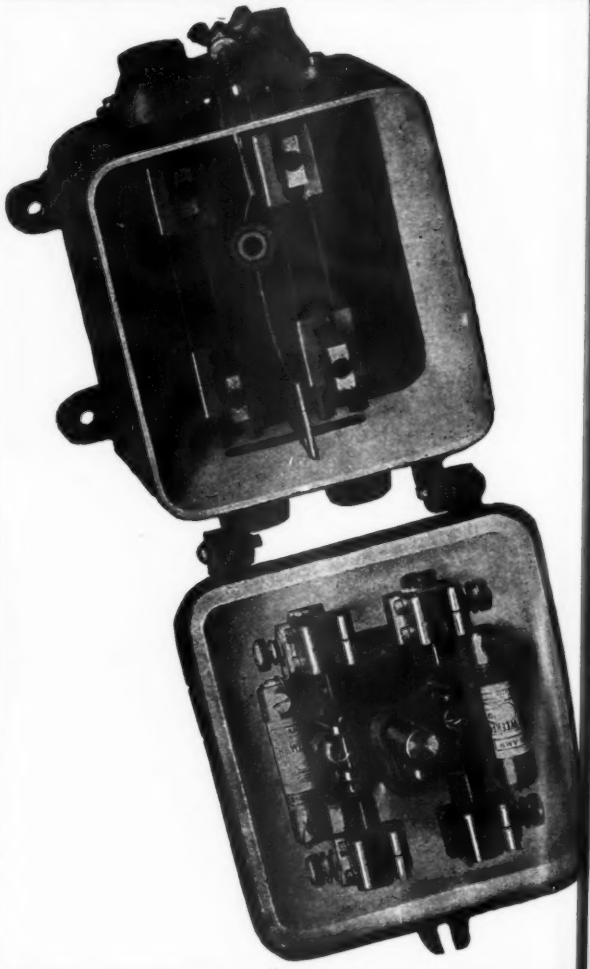

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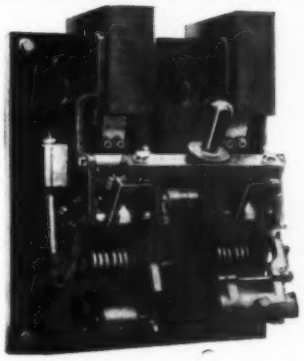

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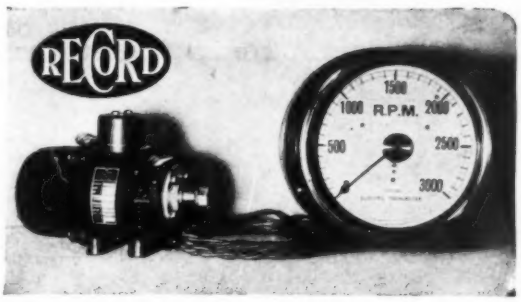

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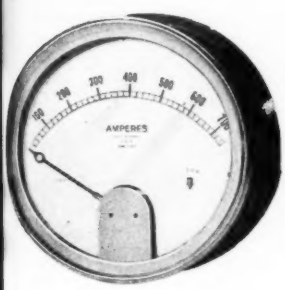

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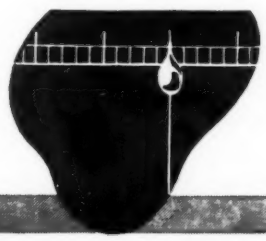

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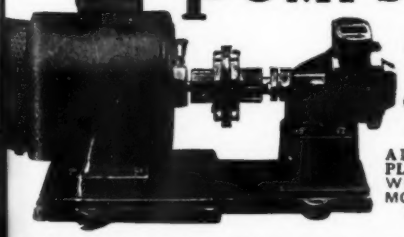

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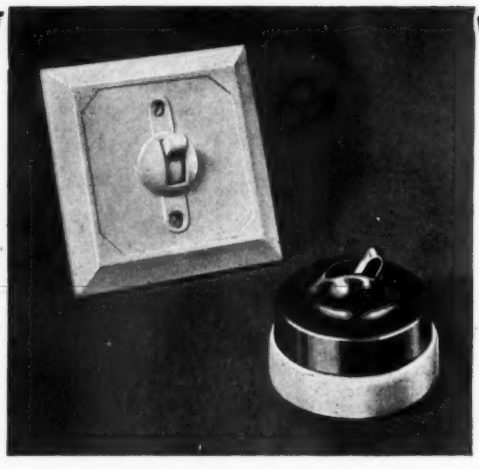

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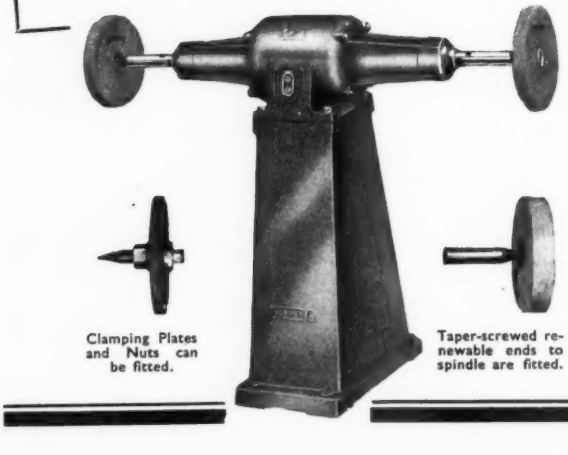

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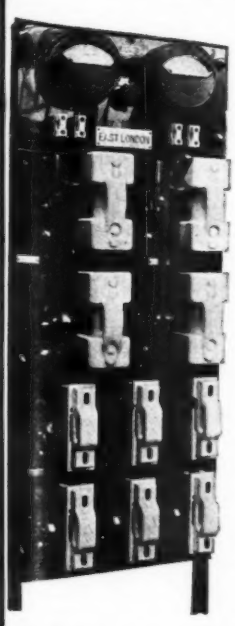

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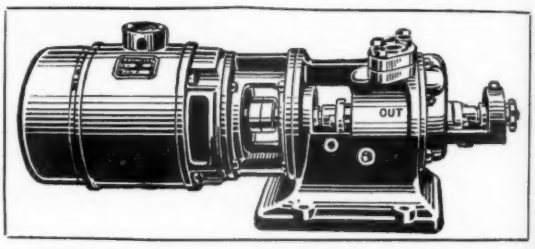

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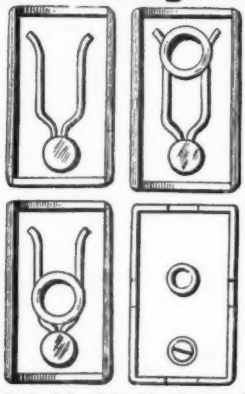

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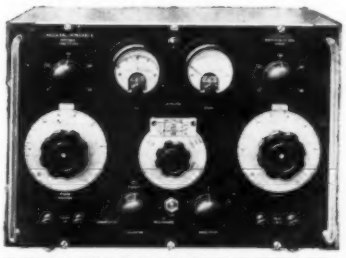

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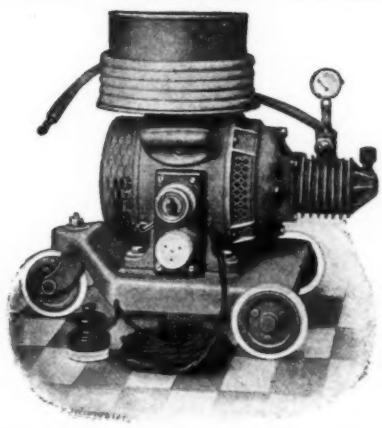

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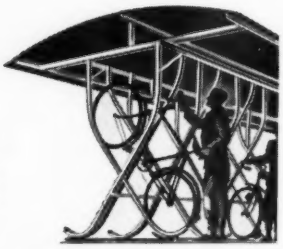

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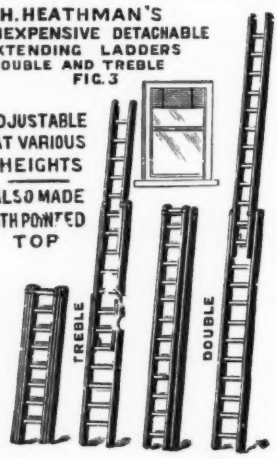

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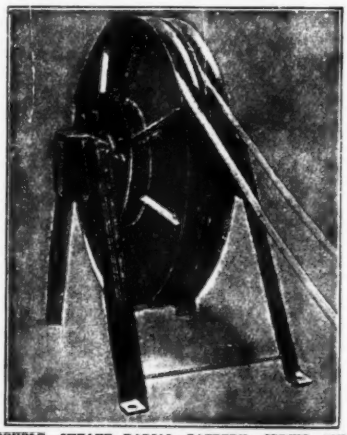

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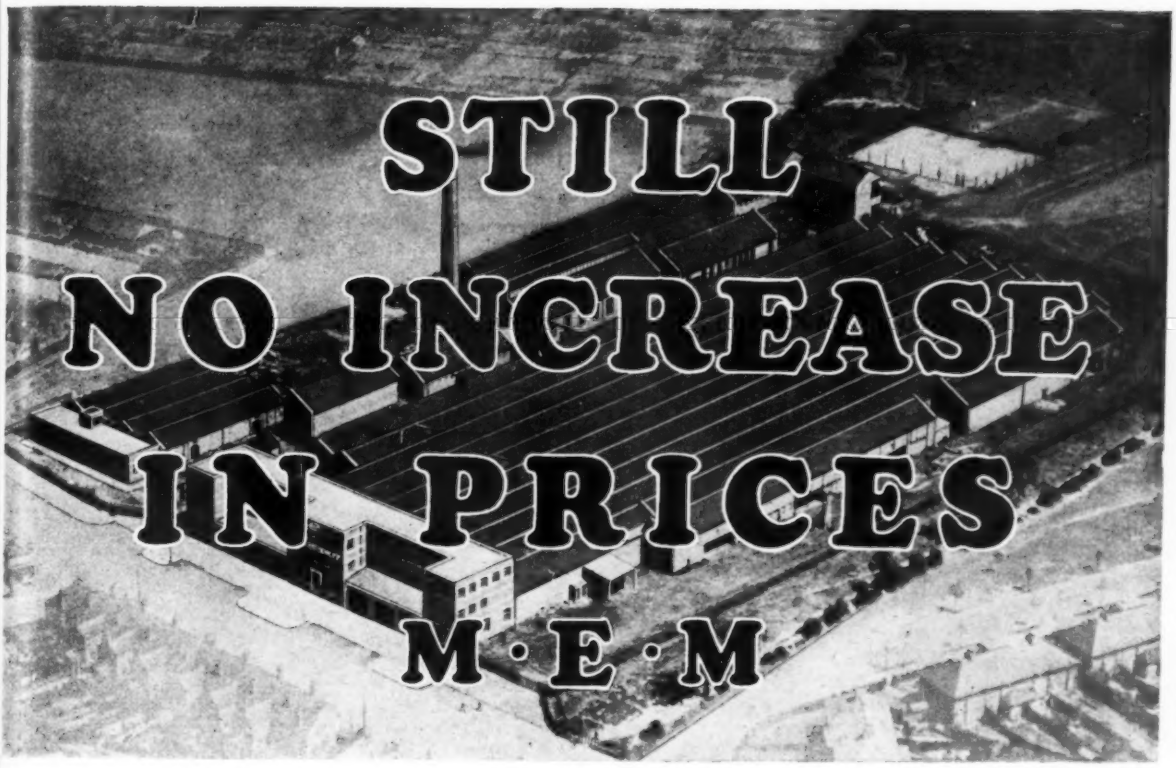

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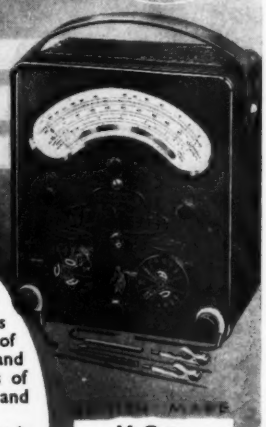

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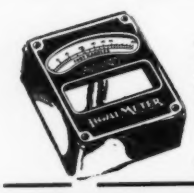

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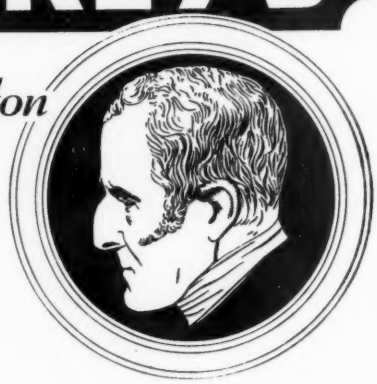

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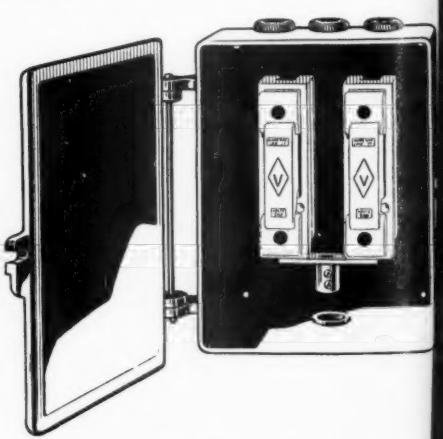

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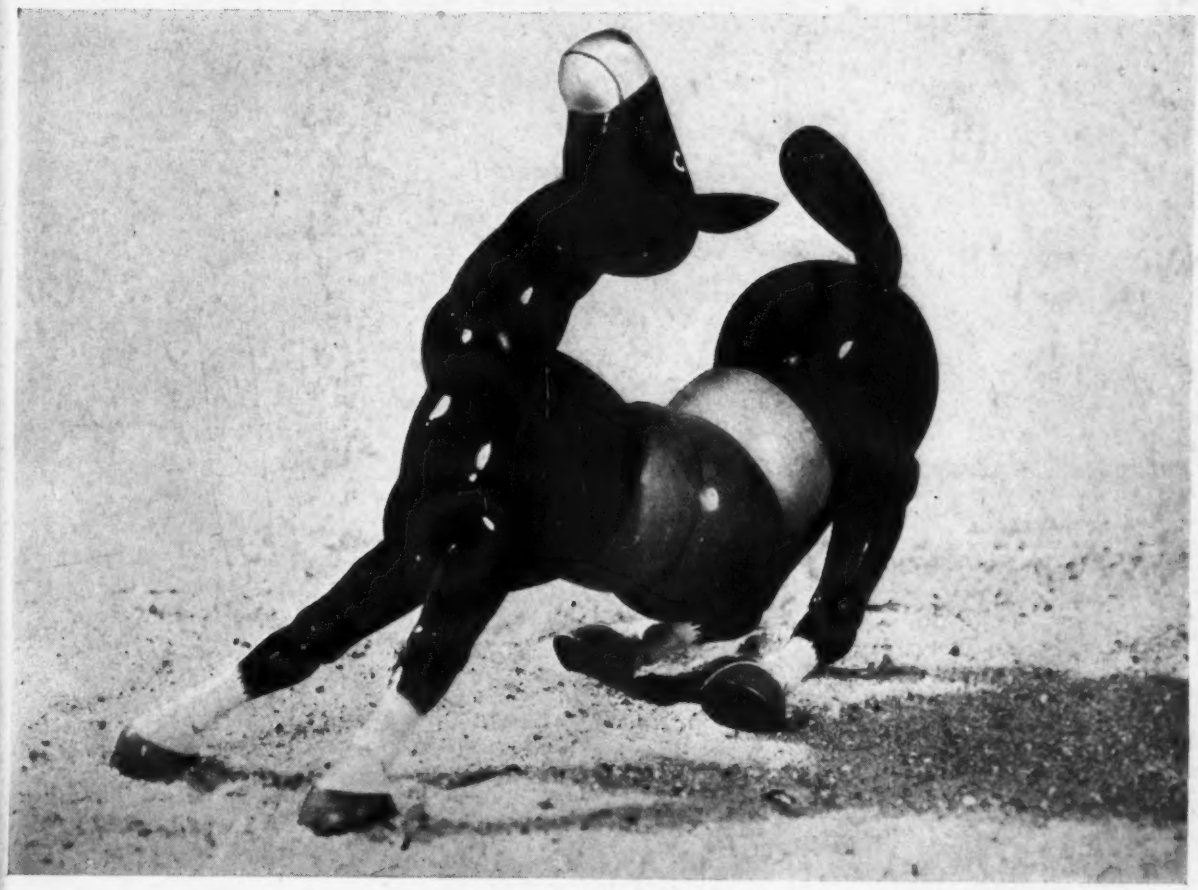

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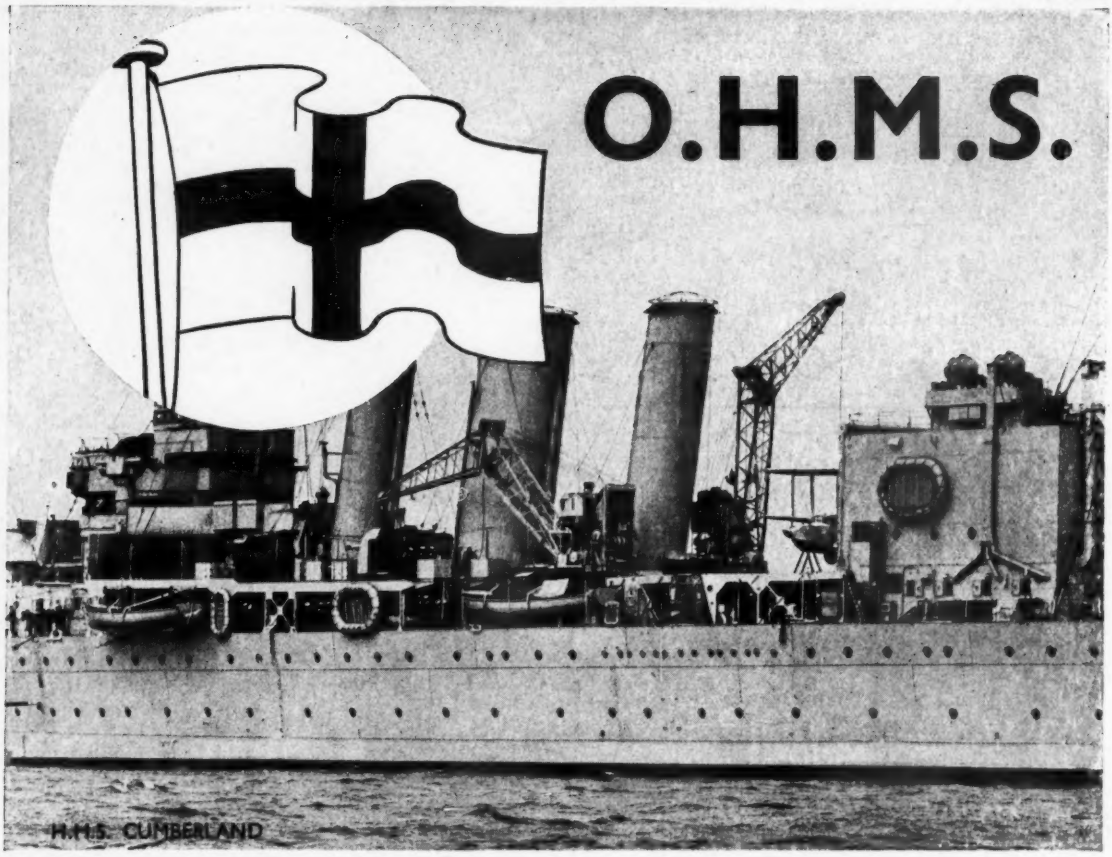

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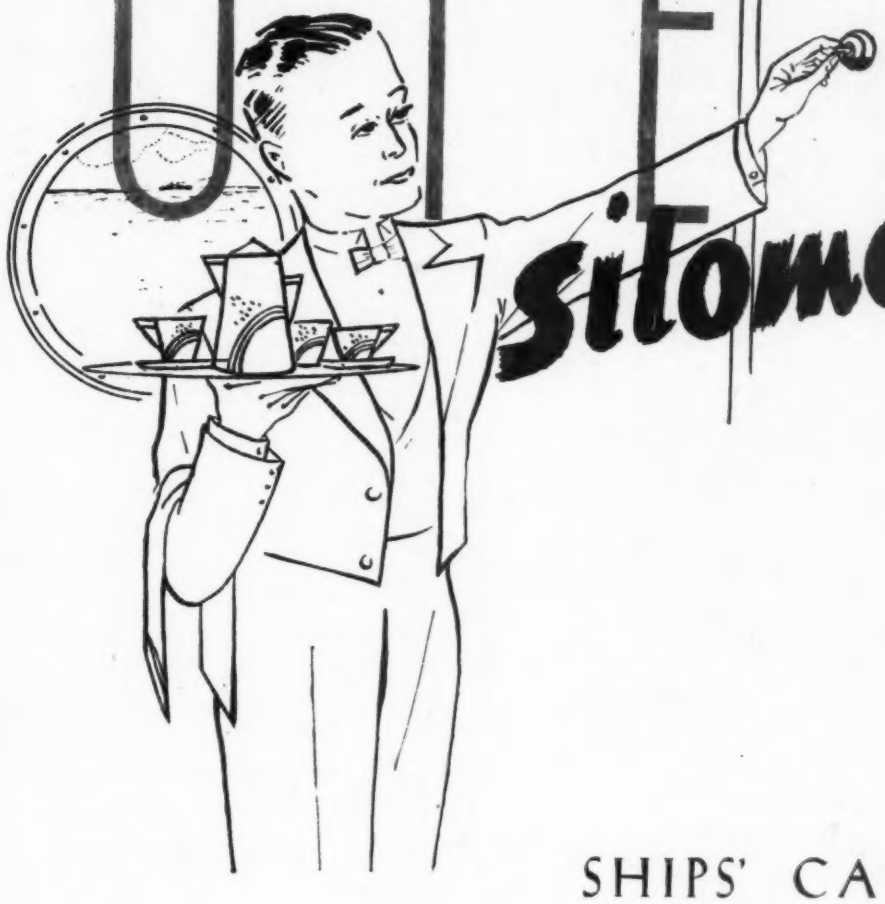
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SHIPS' CABINS

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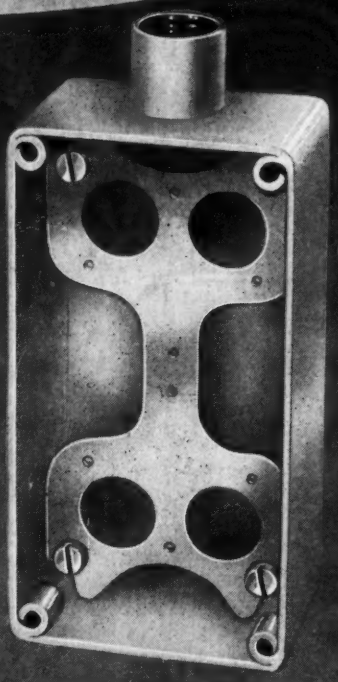
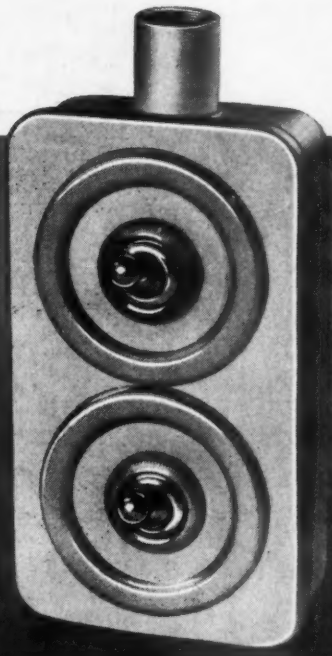


CA5932, Pressed Steel Adjustable Flush Box



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